NEW ENTRANTS IN THE NATIONAL AIRSPACE: POLICY, TECHNOLOGY, AND SECURITY ISSUES FOR CONGRESS

HEARING BEFORE THE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE ONE HUNDRED SIXTEENTH CONGRESS FIRST SESSION MAY 8, 2019 Printed for the use of the Committee on Commerce, Science, and Transportation

Available online: http://www.govinfo.gov

U.S. GOVERNMENT PUBLISHING OFFICE WASHINGTON : 2023
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing held on May 8, 2019</td>
<td>1</td>
</tr>
<tr>
<td>Statement of Senator Wicker</td>
<td>1</td>
</tr>
<tr>
<td>Statement of Senator Cantwell</td>
<td>2</td>
</tr>
<tr>
<td>Statement of Senator Fischer</td>
<td>31</td>
</tr>
<tr>
<td>Statement of Senator Cruz</td>
<td>33</td>
</tr>
<tr>
<td>Statement of Senator Peters</td>
<td>34</td>
</tr>
<tr>
<td>Statement of Senator Blackburn</td>
<td>36</td>
</tr>
</tbody>
</table>

### WITNESSES

- Jay Merkle, Executive Director, Unmanned Aircraft Systems Integration Office, Federal Aviation Administration ............................. 4
- Joint prepared statement of Jay Merkle and Wayne Monteith ............... 6
- Wayne R. Monteith, Associate Administrator, Office of Commercial Space Transportation, Federal Aviation Administration ........... 10
- Dallas Brooks, Director, Raspet Flight Research Laboratory, Mississippi State University ................................................. 11
- Prepared statement .................................................................. 13
- Zach Lovering, Vice President, Urban Air Mobility Systems, Airbus ..... 15
- Prepared statement .................................................................. 16
- Eric Stallmer, President, Commercial Spaceflight Federation .......... 20
- Prepared statement .................................................................. 21

### APPENDIX

- Letter dated May 6, 2019 to Hon. Roger and Hon. Marie Cantwell from Marc Rotenberg, President, EPIC; Jeramie Scott, Senior Counsel, EPIC; and Caitriona Fitzgerald, Policy Director, EPIC .......................... 41
- Response to written questions submitted to Jay Merkle by:             41
  - Hon. Jerry Moran .................................................................. 45
  - Hon. Marsha Blackburn ....................................................... 45
  - Hon. Mike Lee ....................................................................... 46
  - Hon. Amy Klobuchar ............................................................. 51
  - Hon. Brian Schatz ............................................................... 51
  - Hon. Tammy Baldwin ......................................................... 51
  - Hon. Jon Tester ................................................................... 52
  - Hon. Jacky Rosen .................................................................. 54
- Response to written question submitted to Wayne Monteith by:         55
  - Hon. Amy Klobuchar ............................................................. 51
- Response to written questions submitted to Eric Stallmer by:          55
  - Hon. Roger Wicker ................................................................ 56
NEW ENTRANTS IN THE NATIONAL AIRSPACE:
POLICY, TECHNOLOGY, AND SECURITY
ISSUES FOR CONGRESS

WEDNESDAY, MAY 8, 2019

U.S. SENATE,
COMMITEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 9:30 a.m. in room SD–G50, Dirksen Senate Office Building, Hon. Roger Wicker, Chairman of the Committee, presiding.
Present: Senators Wicker [presiding], Thune, Cruz, Fischer, Gardner, Blackburn, Lee, Young, Scott, Cantwell, Blumenthal, Markey, Peters, and Tester.

OPENING STATEMENT OF HON. ROGER WICKER,
U.S. SENATOR FROM MISSISSIPPI

The Chairman. Good morning. The Committee will come to order.
We convene this morning to discuss the policy, technology, and security issues involving the integration of new entrants into our national airspace system. So welcome to everyone.
The United States has the safest and most diverse air transportation system in the world. Our national airspace is a vital resource and is used by 1.7 million Americans who take to the skies every day. Unbelievable.

Newer operators are poised to take advantage of our airspace in exciting ways. The safe and efficient integration of new entrants presents formidable challenges.
I would like to welcome our witnesses for today’s hearing. They bring a range of government, industry, and academic perspectives to these issues.
We are joined by Jay Merkle, Executive Director of the UAS Integration Office at the FAA; Wayne Monteith, Associate Administrator for Commercial Space Transportation at the FAA; Dallas Brooks, Director of the Raspet Flight Research Laboratory at Mississippi State University; Eric Stallmer, President of the Commercial Spaceflight Federation; and Zach Lovering, Vice President of Urban Air Mobility Systems for Airbus.

Last year’s FAA Reauthorization Act helped pave the way for the new rules recently proposed by the FAA to expand opportunities for drone use. The drone community is also eager for a rulemaking process regarding remote identification of drones, or “remote ID.” The remote ID rulemaking will be an important milestone because
many operational, privacy, and security concerns can be addressed by readily identifying each object in the sky and its operator. And we certainly hope so, and perhaps we will hear an update on the agency’s rulemaking at this hearing.

R&D is essential to understanding and mitigating safety risks and to improve the performance of systems and operators. In partnership with the FAA, our research universities are helping to improve air traffic control interoperability, safety, pilot training, and drone traffic management systems. Managed by Mississippi State University, the ASSURE Center of Excellence is comprised of 23 universities tasked with much of this research agenda. I would note that those universities are represented by seven Senators on this committee. Can you imagine? So we will hear about that today.

The commercial space launch sector is another growing industry that requires our attention. Once the domain of powerful nation states, the commercial space launch is fast becoming an affordable commercial service that may soon include space tourism. Rockets must transit the airspace to and from space. General Monteith’s organization is responsible for licensing commercial launch and re-entry operations. The companies represented by Mr. Stallmer’s organization are making sure that General Monteith stays busy. So I hope witnesses will provide their perspectives on how the FAA can support this industry while maintaining a safe and efficient airspace system.

Finally, many companies are developing electrically powered aircraft that can quickly take a few passengers between fixed spots in a crowded city. And I don’t want to be one of the people to avail myself of these flying taxis, a promising aspiration for many who wish to avoid today’s congested highways—and who does not? However, many technical and policy questions remain for what is called “urban air mobility.” The Committee is interested in hearing from witnesses about some of the future possibilities associated with urban air mobility.

The skies of the future are sure to look different from those of today. While there should be concerns with safety, efficiency, and security of new technologies, we need to be prepared to enable innovation and change.

Senator Cantwell, what do you say?

STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

Senator CANTWELL. Thank you, Mr. Chairman. Thank you for holding this important hearing and calling the witnesses this morning. And I know we have a busy schedule this morning. So I am just going to move right into it.

Today we are going to hear about the integration of two important users to the national airspace system, unmanned aerial vehicles, as you were just discussing, and the commercial space launch companies. Both are areas of great potential and come with unique challenges to be addressed by us, the stakeholders, and the FAA.

In 2017, the U.S. led the world in the number of space launches for the first time in almost 15 years. American ingenuity and competitiveness put us back on top, and this committee has an oppor-
tunity to ensure that the bureaucratic red tape is not the reason we cede this leadership to space in the future.

Commercial space launch in the United States has seen a huge growth over the last decade with new entrants like Blue Origin, SpaceX, and others coming online, as well as new large satellite constellations. So we can expect that we are going to see a continuation of launch activities increasing every year.

It has been remarkable to watch this growth explode in my state of Washington and to see its applications in other parts of the United States. Growing the commercial space industry has huge implications for both American security and our economy. In fact, some estimate that the global industry for space to grow from about $360 billion today to over $1 trillion to $3 trillion over the next 20 years. So huge economic opportunities and job creation efforts.

It will be critical for regulators to make sure we continue to facilitate to space in order for this growing industry to flourish, while continuing to ensure that U.S. air travel remains safe around the world. So that issue—we look forward to hearing from our witnesses on how we integrate that in the very near term.

Also, the integration of unmanned aerial vehicles into our airspace requires a balancing act between the safety of our skies, which we can never compromise on, and the many important applications made possible by unmanned aerial vehicles. These applications include fighting wildfires, aiding first responders, infrastructure inspection, farming and fishing issues.

I think for us in the Northwest we had a tragic train accident and it just happened to happen right by Joint Base Lewis-McChord. But the fact that we already had an integrated response team there and they used drone systems, even though the train derailed onto I-5, within 24 hours they were able to reopen and move traffic because the drone system gave everybody the confidence that they had the accident site investigation correct. And so that application, in and of itself, giving people the ability to get all that accident and safety information and then thereby clearing the scene is such an important application and I really cheerlead those at home who made that application work so cost effectively there.

So the use of drones can save money. They can improve our delivery of systems and improve our quality of life.

So many on this panel have heard from constituents who are working on innovative solutions to existing problems and want to develop new markets for unmanned aerial vehicles. And so the FAA has had to work to make these applications through a waiver process, the use of part 107 for commercial use of small drones, and work with the FAA and unmanned aerial vehicle test sites.

So while I know that applications can happen faster than our ability to integrate them, implementing them is a very important process of meeting these new challenges.

Right now, for example, the entire industry is waiting for the FAA to issue a rule on remote identification standards. So these remote ID standards are a critical part to unlocking the next area of unmanned aerial vehicle activity. And so we want to make sure that we are including this as part of our top priorities.
These new UAS uses that a remote ID is able to maintain and help with the safety and identification and to allow the unmanned traffic management system to work effectively—I can assure you, as I have seen demonstrations of these unmanned aerial vehicles, I can just think of all the applications immediately that would be helpful, whether that is delivering medicine, delivering critical supplies, or even in some of our challenging areas of the Pacific Northwest where natural disasters are something we have to think about all the time, getting the right product and supply into a community can be very critical.

So we look forward to hearing the discussion this morning about that rulemaking and where we are.

So there is plenty of work to be done, and we have a vision before us. So in addition to certifying aircraft and the rigorous standards to carry passengers, the FAA and the industry will need to develop this very reliable traffic management system and work with our communities on how to integrate our existing infrastructure.

So I thank all the witnesses for your work and for appearing today to discuss how we keep moving forward together. Thank you.

The CHAIRMAN. Thank you, Senator Cantwell.

And thank you to our witnesses. We appreciate you all agreeing to come 30 minutes early. We were planning to begin this hearing at 10. There is a series of five votes beginning at 10, and that has thrown our schedule into confusion today. But we are going to do the best we can. And I think if we make the best use of the next half hour, we will be in good shape.

So, Mr. Merkle, we will recognize you. Your full statements will be included in the record, and if you will limit remarks to less than 5 minutes, we would appreciate it. You are recognized, sir, Mr. Merkle.

STATEMENT OF JAY MERKLE, EXECUTIVE DIRECTOR, UNMANNED AIRCRAFT SYSTEMS INTEGRATION OFFICE, FEDERAL AVIATION ADMINISTRATION

Mr. Merkle. Thank you, Chairman Wicker, Ranking Member Cantwell, members of the Committee.

Unmanned aircraft systems, or UAS, present a dynamic shift in the way people interact with aviation. No longer is aviation limited to manned aircraft at airports. With UAS, we see a vast increase in possibility for airborne services and benefits, ideas limited only by the imagination of a new breed of aviator.

I am pleased to appear before you today to discuss the FAA's commitment to keeping pace with this transformation while ensuring safety and access for all users of the national airspace system.

Enabling the safe integration of UAS and supporting innovation are key priorities of this administration and Secretary Chao. The UAS has fundamentally created a dynamic change in aviation that we have not seen since the dawn of the jet age. The volume of UAS operations has already outpaced manned aircraft. That is not surprising given that there are nearly four times as many UAS registered as there are manned aircraft, and that is just since December 2015 when we first started registering the UAS.

To enable the ever-increasing volume of UAS operations, the FAA has a robust program of existing regulations and guidance. In
addition, we have pending rulemaking actions to address public safety and security concerns, enable operations over people, and require external markings. The next critical piece will be the requirement of universal remote identification or ID, which will allow the FAA and our security partners to more easily locate a drone operator when necessary. A remote ID standard will open the doors to safe, routine advanced operations.

While we undertake these rulemaking efforts, we continue working with many stakeholders to actually test the UAS operations and perform necessary research. Evaluating actual flights of UAS performing different activities and functions provides invaluable data and helps identify problems and solutions. We do this by partnering with FAA test sites, our UAS Center of Excellence, AS-SURE, and through Partnerships for Safety Program and through initiatives like the UAS Integration Pilot Program.

In 2017, President Trump directed the Secretary of Transportation to launch the IPP to safely test and validate advanced operations of drones in partnership with State, local, and tribal governments. Through the IPP, we are seeing examples of these new operations. In Kansas, the State Department of Transportation demonstrated the use of these drones for power line inspections. In North Carolina, a drone was used to demonstrate medical package delivery. Most recently, we granted our first air carrier certification for a commercial drone operator for package deliveries in Blacksburg, Virginia.

The FAA’s ultimate goal is to safely integrate UAS into the NAS. Given the expected volume of drone operations, drone traffic management must be automated. We took an initial step in that direction by deploying the low altitude authorization notification capability, or LAANC. LAANC gives operators the ability to request and receive real-time authorization from the FAA. A process that previously took weeks now takes seconds. LAANC is now live at nearly 300 air traffic facilities covering approximately 500 airports and will expand to more than 100 new sites this month.

Overall, UTM is essentially a set of concepts and tools being developed by NASA, FAA, UAS operators, and UTM service suppliers to safely deconflict and facilitate drone operations. Recently Defense, Homeland Security, and other security partners have joined the FAA development of the UTM concept in support of their missions. Yesterday, we took another important step by supporting integration by issuing information to airports on how to safely implement UAS detection.

Throughout our history, the FAA has adapted to changes in technology and has successfully integrated new operators and operations. We are committed to working with Congress and all of our stakeholders to find a solution to our common challenges. With the support of this Committee and the engagement of our stakeholders, we will continue to safely, securely, and efficiently integrate UAS and solidify America’s role as the global leadership in aviation.

This concludes my statement. I would be happy to respond to any questions you may have.

[The prepared statement of Mr. Merkle and Mr. Monteith follow:]
Federal Aviation Administration Joint Statement of: Brigadier General Wayne R. Monteith, United States Air Force (Ret.), Associate Administrator for Commercial Space Transportation and Jay Merkle, Director, Unmanned Aircraft Systems Integration Office

Chairman Wicker, Ranking Member Cantwell, Members of the Committee:

We are pleased to appear before you today to discuss the integration of commercial space transportation operations and unmanned aircraft systems (UAS) into the National Airspace System (NAS). For the Federal Aviation Administration (FAA), both commercial space transportation and UAS present new challenges as the technology evolves and the number of entrants expands. The FAA is committed to keeping pace with new entrants while ensuring safety and access for all users of the NAS.

Commercial Space Transportation Overview

The FAA, through the Office of Commercial Space Transportation (AST), issues licenses and permits for the launch and reentry of commercial space vehicles consistent with public health and safety, safety of property, and the national security and foreign policy interests of the United States. Congress has directed that AST’s mission also includes the responsibility to encourage, facilitate, and promote U.S. commercial space transportation. These statutory mission objectives provide a framework that has proven to be beneficial both to the industry and to the American people. Our track record bears this out; while the FAA has licensed or permitted over 375 launches and reentries since 1989, there have never been any fatalities, serious injuries, or significant property damage to members of the public.

The commercial space transportation industry in the United States is dynamic, growing, and evolving. In Fiscal Year 2018, there were 32 launches and 3 reentries of commercial space vehicles for a total of 35 licensed activities—a record. For Fiscal Year 2019, we anticipate as many as 44 launch and reentry operations—potentially a single-year increase of over 25 percent in commercial space activity. As the industry continues to grow, the FAA has intensified its efforts to fulfill its commercial space transportation mission, maintaining the highest level of safety without stifling industry expansion.

Streamlining the Commercial Space Transportation Regulatory Program

President Trump, through Space Policy Directive 2, directed the Secretary of Transportation to streamline existing launch/reentry regulations to create an environment that promotes economic growth, minimizes uncertainty, protects safety, security, and foreign policy interests, and encourages American leadership in space commerce. This directive was well-timed in light of the challenges the FAA faces with the current commercial space transportation regulatory framework. Current regulations are based largely on Federal launch standards that were developed in the 1990s. They are often overly prescriptive and seen as a hindrance to innovation. For example, 14 CFR parts 415 and 417 address the launch of expendable launch vehicles (ELVs) and are based on standards developed nearly 30 years ago. Further, the current rules are neither streamlined nor consolidated to the extent they should be.

Although these separate regulatory parts and requirements satisfied the need of the commercial space transportation industry at the time they were issued, the industry has changed and continues to evolve. The FAA recently published a comprehensive Notice of Proposed Rulemaking (NPRM) that proposes to consolidate, update, and streamline all launch and reentry regulations into a single performance-based rule—14 CFR part 450—to better fit today’s fast-evolving commercial space transportation industry. Proposed new part 450 will include regulations applicable to all launch and reentry vehicles, whether they have reusable components or not. The proposed updated rule aligns with the Administration’s goals of creating an environment that does not unnecessarily hinder industry innovation and, most importantly, preserves safety objectives without prescribing specific solutions.

Keeping Pace with Technological Advancements

The pace at which the commercial space transportation industry continues to change has resulted in an increase in both the complexity and the workload for AST. Today’s environment has required the FAA to reevaluate its commercial space

1 https://www.whitehouse.gov/presidential-actions/space-policy-directive-2-streamlining-regulations-commercial-use-space/
structure in terms of people, processes, and tools in order to continue to fulfill the commercial space transportation mission. Specifically, Secretary Chao recently directed AST to undertake a review and reorganization of the Office to maximize efficiencies under a streamlined regulatory regime while continuing to prioritize safety. We are currently evaluating options to realize the Secretary's vision.

Other structural changes for AST were recently mandated by Congress in the FAA Reauthorization Act of 2018. Specifically, the Act required the Secretary to identify within AST a centralized policy office known as the Office of Spaceports to support launch and reentry sites and generally support improvement of spaceports. AST is committed to improving safety, removing unnecessary barriers to competitiveness for spaceports, and helping to ensure that the United States commercial space transportation infrastructure finds its right place in the NAS. We recognize that spaceports have significant potential to become important economic hubs and have already licensed 12 non-Federal spaceports. Further, in response to the recent Congressional direction on spaceports, we are glad to report that the Spaceports Office has been stood-up and is actively working with Spaceport licensees.

Additionally, as part of AST's continual effort to improve the future of space transportation, we continue to engage with our partners in academia, industry, and government on research and development related efforts related to regulatory streamlining, space policy, finance, safety, and innovation. For example, since 2010, AST has partnered with the Center of Excellence for Commercial Space Transportation, which conducts research in a number of different areas including aerospace vehicles, human spaceflight, and aerospace access and operations.

**Integration of Commercial Space into the National Airspace System (NAS)**

Of the many challenges the FAA faces, integration of commercial space transportation operations into the NAS is a top priority. Commercial space transportation operations are currently treated as "special cases" in which air traffic controllers block off large sections of airspace for extended periods of time for a single launch or reentry operation. Although we have safely managed and executed this process for many years, it is unsustainable in the long run given the expected growth in commercial space transportation operations. Moreover, the current manual process is resource intensive, inefficient, and susceptible to possible errors. Under these limitations, the FAA can only support one mission at a time.

We are actively working on multiple initiatives to develop potential solutions to the issue of how commercial space transportation will grow within the NAS alongside commercial and general aviation. We are working with the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey and recently stood-up the agency's first dedicated Commercial Space Integration Lab for concept development and prototyping of new technologies that will be leveraged towards integrating commercial space transportation into the NAS. This lab currently houses our Space Data Integrator (SDI) prototype and a prototype aircraft hazard area (AHA) generator, called HRAM (or Hazard Risk Assessment Management), which the FAA's NextGen organization has developed.

Additionally, AST continues its work with the FAA's Air Traffic Organization and Project Management Organization on developing, testing, and implementing the SDI. This safety-based technology, which will automate the current manual process, will enable the FAA to track a licensed launch or reentry operation as it transitions through the airspace. When deployed, this technology will enable the FAA to safely reduce the amount of airspace that must be closed to other users and more quickly release airspace that is no longer at risk as a mission progresses.

The FAA is fully engaged in balancing the needs of all airspace users—including traditional manned aircraft, drones, commercial space vehicles, and others. We are making progress with an Aviation Rulemaking Committee (ARC) with representation across the spectrum of NAS users to address airspace access priorities. The ARC plans to provide recommendations that will improve near-term and future commercial space transportation operations and their integration into the NAS. The ARC's charter is set to expire in November of this year. We look forward to receiving the ARC's report and recommendations.

**Unmanned Aircraft Systems Overview**

The steady development and expansion of Unmanned Aircraft Systems (UAS) has created a dynamic change in aviation that we have not seen since the dawn of the jet age. The FAA is committed to supporting this change and to working with the UAS community to ensure that this technology is integrated into the NAS safely and securely. UAS offer expanded capabilities in aviation with a fast pace of innovation and increasing volume of operations. For example, the progression of UAS innovation and the change in product cycles can generally be measured in months, not
years. Similarly, the volume of UAS operations is outpacing manned aircraft. Currently, there are nearly four times as many UAS as registered manned aircraft.

The new dynamics that UAS bring to the NAS redoubles our focus on the safety of all aircraft operations as the FAA’s first priority as we work on a number of initiatives to support UAS integration. An ongoing challenge to UAS integration is the potential for conflict between manned and unmanned aircraft. We have continued to engage in outreach to UAS operators and the public at large to educate current and prospective drone users about their safety responsibilities. Efforts such as the “Know Before You Fly” information campaign have encouraged UAS operators to understand the rules and responsibilities for flying an aircraft in the NAS. This campaign and the FAA’s related work on the “B4UFLY” mobile application are bearing fruit; we are beginning to see a reduction in the number of reported UAS sightings from pilots of manned aircraft.

**UAS Rulemaking**

The FAA is focused on enabling an ever-expanding universe of UAS operations and capabilities. In order to allow for such operations to be conducted safely and securely, the FAA has moved forward with a number of regulatory initiatives. Together with the Department’s Office of the Secretary, the FAA recently published a proposed new rule on the operation of small UAS over people. The proposal seeks to balance the need to mitigate safety risks without inhibiting technological and operational advances. The FAA also recently published an advanced notice of proposed rulemaking seeking public input to identify drone safety and security issues and explore ways to mitigate risks UAS may pose to other aircraft, people on the ground, or to national security. The FAA’s security partners have helped to highlight for us some of the important security and public safety questions. Additionally, in February 2019, the FAA published an interim final rule on external marking requirements for small UAS. The rule requires small unmanned aircraft owners to display their unique identifier (registration number) on an external surface of the aircraft. Identifiers are assigned by the FAA upon completion of the registration process. Small unmanned aircraft owners are no longer permitted to enclose the FAA-issued registration number in a compartment. Going forward, the ability to remotely identify UAS operators will be a crucial stepping stone for UAS traffic management and will facilitate what we envision as high volume, safe and secure low-altitude UAS operations.

**UAS Remote Identification**

Congress recognized the importance of remote identification when it enacted the FAA Extension, Safety, and Security Act of 2016. That Act laid the foundation for FAA’s work with operators and our security partners to realize the importance of remote identification and to reach a consensus on how to address it. More recently, the FAA Reauthorization Act of 2018 provided the FAA with additional authority to move ahead with work on universal registration and remote identification—both of which are critical to the success of commercial UAS operations and UAS integration more broadly.

Remote identification is fundamental to both safety and security of drone operations. Remote identification will be necessary for routine beyond visual line-of-sight operations and operations over people, package delivery, operations in congested areas, and for the continued safe operation of all aircraft in shared airspace. It will also be foundational for the advancement of automated passenger or cargo-carrying air transportation—what is often referred to as Urban Air Mobility. From a security perspective, remote identification would enable us to connect a drone to its control station location. With universal remote identification, the FAA and our national security partners will be better able to locate a drone operator, determine if a drone is being operated in a clueless, careless, or criminal manner, and take appropriate action if necessary. The FAA is committed to establishing remote identification requirements as quickly as possible.

**UAS Integration Pilot Program**

In October 2017, President Trump directed the Secretary of Transportation to launch an initiative to safely test and validate advanced operations of drones in partnership with state, tribal, and local governments in select jurisdictions—the
The IPP has been a crucial step in accelerating the Department of Transportation’s and FAA’s UAS integration efforts. The goals of the program, which enjoys the participation of 9 different communities across the country, are to identify ways to balance local and national interests, improve communications with local, state, and tribal jurisdictions, address security and privacy risks, accelerate the approval of operations that currently require special authorizations, and collect data to support the regulatory development steps needed to allow more complex, routine low-altitude operations.

The FAA and the DOT have provided the IPP participants extensive technical assistance and guidance to help them better understand safety risk management and to navigate the process for obtaining approvals. Through the IPP, we are seeing many examples of what will likely become common operations. For example, in Virginia, the IPP lead participant partnered with a commercial entity to demonstrate the swift package delivery of a frozen popsicle to a child in his family’s backyard in Blacksburg, VA. In Oklahoma, the Choctaw Nation and Oklahoma State University demonstrated the use of a drone to rebait feral hog traps in remote locations in an effort to find ways to minimize crop damage and provide a safer working environment for agriculture workers. In Kansas, the State Department of Transportation demonstrated the use of drones for power line inspections, and in North Carolina a drone was used to demonstrate medical package delivery operations over people at a large medical facility. These are only a few of the real-world applications for drones.

The experience gained and the data collected from the IPP will help ensure the United States remains the global leader in safe UAS integration and fully realizes the economic and societal benefits of this technology. In fact, the IPP is already paying dividends on the investment. Recently, the FAA granted the first air carrier certification to a commercial drone operator for package deliveries in rural Blacksburg, Virginia. Although the regulatory framework for broader drone operations is not complete, the IPP has helped to inform the FAA and drone operators of the extent to which operations can begin under existing rules.

UAS Integration into the NAS

The FAA’s ultimate goal is to integrate, not segregate, UAS into the NAS. Given the expected volume of drone operations, drone traffic management must be automated. The basic rules for small UAS operations—14 CFR part 107—set the global standard for integration and provided small drone operators with unprecedented access to the NAS. Under part 107, drone operators generally must secure authorization from the FAA to operate in any airspace where air traffic control is providing separation services. To facilitate those approvals, we deployed the prototype Low Altitude Authorization and Notification Capability (LAANC) at air traffic facilities to evaluate the feasibility of a fully automated solution enabled by public/private data sharing. LAANC gives drone operators the ability to request and receive near real-time response from the FAA to authorization requests, which allows operators to quickly plan and execute their flights. Air Traffic is also made aware of the locations where planned drone operations will take place. This capability alleviates the burden of individually processing requests for airspace authorizations by providing near real-time authorization—a process that previously took weeks, now takes seconds.

Based on the prototype’s success, LAANC is now live at nearly 300 air traffic facilities covering approximately 500 airports, and will expand to more than 100 new sites this month.

LAANC is an important foundational step in the implementation of UAS Traffic Management (UTM). Overall, UTM is essentially a set of concepts and tools being developed by the National Aeronautics and Space Administration (NASA), the FAA, UAS operators, and UTM service suppliers to safely de-conflict and facilitate dense low-altitude drone operations. Recently, the Department of Defense, the Department of Homeland Security, and other national security partners have joined in the development of UTM concepts to support their missions. UTM is not a specific equipment system; it will be complementary to the existing air traffic management system and will not replace it. Congress granted the authority to conduct UTM research and an initial pilot program to NASA and the FAA in 2016. While the FAA continues to support the pilot program and the final stages of NASA’s UTM testing, the FAA is already implementing foundational UTM capabilities like LAANC. As part of the FAA Reauthorization Act of 2018, Congress provided continued broad authority for UTM implementation, which will allow the FAA to continue its important work to

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https://www.whitehouse.gov/presidential-actions/presidential-memorandum-secretary-transportation/
balance the needs of all system users and ensure that drones are fully and safely integrated into the NAS.

The FAA’s Center of Excellence for Unmanned Aircraft Systems—Alliance for System Safety of UAS through Research Excellence (ASSURE) is also providing the FAA with critical information to support safe and secure UAS integration. ASSURE is comprised of 15 of the world’s leading research institutions, led by Mississippi State University, along with 8 affiliate universities. It focuses on research, education, and training in areas critical to safe and successful integration of drones into the Nation’s airspace, including UTM.

Additionally, the FAA is working diligently to implement the new statutory framework governing recreational operations of unmanned aircraft contained in section 349 of the FAA Reauthorization Act of 2018. This section provided a limited exception to the FAA rules that would otherwise apply to these operations, so long as the operation adheres to eight limitations set forth by Congress and does not endanger the safety of the NAS. Implementation of this new framework is an important focus area for the FAA this year. We appreciate Congress’ efforts in this area, which will help advance our collective goal of safe and secure integration of unmanned aircraft into the NAS.

Conclusion

Throughout our history, the FAA has adapted to changes in technology and has successfully integrated new operators and equipment into the NAS. We are committed to working with Congress and all of our stakeholders to find solutions to our common challenges. Working together, we are confident we can balance safety and security with innovation. With the support of this Committee and the robust engagement of our stakeholders, we will continue to safely, securely, and efficiently integrate commercial space and UAS into the NAS and solidify America’s role as the global leader in aviation.

This concludes our statement. We would be happy to respond to any questions you may have.

The CHAIRMAN. Thank you very much, Mr. Merkle.

Mr. Monteith.

STATEMENT OF WAYNE R. MONTEITH, ASSOCIATE ADMINISTRATOR, OFFICE OF COMMERCIAL SPACE TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION

Mr. Monteith. Chairman Wicker, Ranking Member Cantwell, members of the Committee, thank you for the opportunity to highlight one of Secretary Chao’s top priorities: to ensure America retains its leadership in commercial space.

Safety is at the core of this priority. The FAA’s Office of Commercial Space Transportation is responsible for issuing licenses and permits for the launch and reentry of commercial space vehicles, consistent with public health and safety, the safety of property, and the national security and foreign policy interests of the United States. Our efforts have proven beneficial to both the space transportation enterprise and the American people, and our track record clearly bears this out. While the FAA has licensed or permitted over 375 launches and reentries since 1989, there has never been a fatality, serious injury, or significant property damage to members of the public.

The commercial space industry in the United States is dynamic, growing, and evolving. In Fiscal Year 2018, there were a record 32 launches and three reentries of commercial space vehicles, for a total of 35 licensed activities. For Fiscal Year 2019, we anticipate as many as 44 launch and reentry operations, potentially a single year increase of 25 percent in commercial space activity.

As the industry continues to grow, the FAA has intensified its efforts to maintain the highest level of safety while preparing for the exciting future to come. And we must prepare for this future. Cur-
rent regulations are based largely on Federal launch standards that were developed in the 1990s. They can be overly prescriptive and seen as a hindrance to innovation. Further, the current rules are not consolidated to the extent they should be and can be duplicative.

To rectify this, we recently published a comprehensive Notice of Proposed Rulemaking that will consolidate, update, and streamline all launch and reentry regulations into a single performance-based rule. This proposed rule will better fit today's fast evolving commercial space transportation industry in a way that does not unnecessarily hinder innovation. Most importantly, the new rules set safety standards without prescribing specific solutions.

The pace at which the commercial space industry continues to change and grow has resulted in an increase in both the complexity and the workload for the FAA's Commercial Space Transportation Office. To address this, Secretary Chao recently directed us to undertake a comprehensive review and reorganization of the office to maximize efficiencies and effectiveness under a new streamlined regulatory regime while continuing to prioritize public safety. We are currently evaluating options to realize the Secretary's vision.

Consistent with the FAA Reauthorization Act of 2018, we established an Office of Spaceports to support launch and reentry sites and generally support improvements of spaceports. I am glad to report this office is already working with spaceport licensees, our interagency partners, and the broader stakeholder community to chart a path to the future.

Of the many challenges the FAA faces, integration of commercial space operations into the national airspace is a top priority. To help address this challenge, we recently stood up the agency's first dedicated commercial space integration lab for concept development and prototyping of new technologies. One of these new technologies is the space data integrator. SDI is a safety-based technology that will lay the foundation to automate the launch and reentry process. This will enable the FAA to track a space mission's progress as it flies through the airspace in real time. When deployed, SDI will enable the FAA to safely reduce the amount of airspace that must be closed to other users and more quickly release airspace that is no longer at risk as a mission progresses. We are at the initial stages of acquisition and we are exploring potential avenues to leverage this capability as quickly as possible. With this technology, along with other efforts, we will be able to better balance the needs of all airspace users, including traditional manned aircraft, drones, commercial space vehicles, and others.

Thank you very much for your time, and I look forward to your questions.

The CHAIRMAN. Thank you very, very much.

Mr. Brooks.

STATEMENT OF DALLAS BROOKS, DIRECTOR, RASPET FLIGHT RESEARCH LABORATORY, MISSISSIPPI STATE UNIVERSITY

Mr. BROOKS. Chairman Wicker, Ranking Member Cantwell, and members of the Committee, thank you for the opportunity to testify before you today.
After 35 years in aviation and 15 years working exclusively in unmanned systems, it seems a bit strange to be classified as a new entrant. But one of the amazing things about this technology is that it is ever-innovative, ever-evolving, and always new. It is also, I am very glad to share with you today, rapidly maturing.

Over these past 15 years, I have been blessed with an amazingly broad and diverse experience in unmanned systems. I have had the privilege of leading incredibly talented people in America’s armed forces, in commercial industry, and at two of the nation’s top universities for unmanned systems research. I have spent two years embedded in the FAA, and I have seen firsthand the challenges that our regulators face in deciding how safe is safe enough. But most of all, I have seen what works and, just as importantly, what does not.

First, what works is blending innovative unmanned technologies with proven aviation practices and a culture of safety. At Mississippi State’s Raspet Flight Research Laboratory we have proven that. We operate the newest, largest, and most technically advanced fleet of unmanned aircraft in academic use today. Our pilots and maintainers are fully qualified and FAA-licensed to fly and maintain both manned and unmanned aircraft. We hold FAA approvals to fly in over 6,000 square miles of national airspace, and we routinely fly in the same traffic patterns, using the same procedures, with manned aircraft. We get to do this because we demand the same level of competence, the same level of professionalism, and the same level of safety as any manned aviation organization in the country.

Second, what works are government and academic partnerships. At Raspet Flight Research Laboratory, we lead the Department of Homeland Security’s Common UAS Test Site, an expansive facility where we evaluate both established and emerging unmanned technologies to better support the brave and talented people who patrol our coasts, protect our borders, and respond to our national emergencies. Mississippi State University also leads the FAA’s UAS Center of Excellence, comprised of 23 of the world’s top unmanned systems research universities. To date, the results from over 20 of our research projects are directly informing and improving FAA policy, guidance, and rulemaking. No other organization has done more and in less time to advance unmanned systems integration than the ASSURE Center of Excellence.

Third, what works is interagency collaboration. For many years, I have had the privilege of co-chairing the UAS Science and Research Panel, which coordinates and conducts UAS research across eight Federal agencies. The SARP, as it is known, brings together the technical, policy, and operations experts from these organizations to focus on one key problem at a time and to resolve it in a year or less. Recently the SARP defined what may be the most important number in all of unmanned aviation: the minimum safe distance at which UAS may operate in proximity to other aircraft. Today, the SARP is tackling how UAS operations can be safely enabled at or near our nation’s airports, and we will be sharing those answers shortly.

And finally, what works is industry engagement. Both the ASSURE UAS Center of Excellence and the SARP routinely collabo-
rate with industry to exchange ideas, explore emerging technologies, and to ensure that our research results are relevant and current. Industry is where innovation happens, and we in government should never forget that.

Now, throughout my testimony, you may have noticed a common thread, that focus breeds success. Focused organizations such as the Center of Excellence and the SARP have produced the most relevant, the most effective, and most substantiated body of evidence to support key decisions by both industry and government alike. By following our model of scoping and prioritizing key problems, selecting team members for expertise and effectiveness, and putting strong, accountable leadership in place, our nation’s government can achieve more in less time and more safely than ever before.

Members of the Committee, as I close my testimony, I will leave you with some specific points where your leadership can make a difference.

First, support what works and question what does not. Success in UAS integration has always come in bites, not in meals. Those who 15 years ago were trying to solve all of our problems at once are still trying. Meanwhile, those teams that have focused their energies on specific problems have succeeded.

Second, set deadlines and enforce them. Some of the most significant advances in UAS integration have come, not coincidentally, following mandates from Congress, mandates that were tied to specific, short-term deadlines. The key is in scoping legislation to ensure that the goals you set are aggressive, yet fair, and that they are achievable safely.

Third and most specifically, I ask for your support in removing unnecessary layers of review from our nation’s unmanned systems research programs. Due to a recent policy change mandating Department-level review, it now takes up to six times longer for the FAA to approve UAS Center of Excellence research. Such reviews add no discernable value not perceivable effect other than slowing a once efficient process from a few weeks to many months.

Chairman Wicker, Ranking Member Cantwell, and members of the Committee, I thank you again for the opportunity to testify before you today. Should you need further details on these or other unmanned systems issues, Mississippi State University and the Raspet Flight Research Laboratory stand ready to support you.

[The prepared statement of Mr. Brooks follows:]

**PREPARED STATEMENT OF DALLAS BROOKS, DIRECTOR, RASPET FLIGHT RESEARCH LABORATORY, MISSISSIPPI STATE UNIVERSITY**

Chairman Wicker, Ranking Member Cantwell, members of the Committee, thank you for the opportunity to testify before you today.

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Chairman Wicker, Ranking Member Cantwell and members of the Committee, I thank you again for the opportunity to testify before you today. Should you need further details on these or other unmanned systems issues, Mississippi State University and the Raspet Flight Research Laboratory stand ready to support you.

The CHAIRMAN. Thank you very much.
Mr. Lovering.

STATEMENT OF ZACH LOVERING, VICE PRESIDENT, URBAN AIR MOBILITY SYSTEMS, AIRBUS

Mr. Lovering. Good morning, Chairman Wicker, Ranking Member Cantwell, and members of the Committee.

Airbus is honored to participate in today's important hearing on new entrants in the aerospace market, and we appreciate your interest in the important role of the future of our industry. We look forward to sharing Airbus' vision for safe urban air mobility, or UAM, and providing a brief overview of our efforts to safely integrate new aircraft into the national airspace system, or the NAS.

My name is Zachary Lovering and I am a senior member of Airbus' global UAM team based here in the United States. I joined three years ago as Chief Engineer and then became Project Executive leading the development of Vahana, a self-piloted electric vertical takeoff and landing, or eVTOL, demonstrator aircraft.

In my current role as the Vice President of UAM Systems, I lead the teams that are integrating the various supporting systems like air traffic management, vehicles, and infrastructure into a single mobility framework to ensure that our UAM vision fully lives up to its promise.

Airbus is a pioneer in the global aerospace industry and has a major presence in the United States. In June 2018, Airbus created a unit to lead its global UAM activities across the company.

Airbus Urban Mobility is focused on air traffic management, on-demand mobility, infrastructure, community integration, industry partnerships, and government regulations. The unit also steers the development of Airbus' ongoing eVTOL technology demonstrators, Vahana, a small tipped wing, self-piloted eVTOL, and CityAirbus, a large multi-rotor eVTOL.

By 2030, over 60 percent of the world's population will live in urban areas, and we believe our UAM solutions can help cities cope with this massive population growth and better connect our urban, suburban, and rural communities.

The challenge of making the UAM a reality is bigger than any one company, and ensuring this industry lives up to its promise will require the collaboration of stakeholders inside and outside of the aerospace community.

Over the last few years, Airbus has made steady progress on its efforts to re-imagine how aviation safely integrates into the NAS. To date, Airbus Urban Mobility has focused on demonstrating safe UAM vehicles, building unmanned traffic management solutions and services, enabling city integration through infrastructure design, exploring tomorrow's UAM passenger experience today, and responding to critical policy and regulatory gaps with solutions.

One recent milestone has been demonstrating safe UAM aircraft. Since January 2018, Vahana has been flying as a full-scale demonstrator at the UAS test site in Pendleton, eastern Oregon. After nearly 60 full-scale flights and over 1,000 sub-scale flights, it has recently proven its capability to take off vertically and then transition to full wing-borne flight, marking the completion of its nominal flight test program.
In addition, CityAirbus has recently completed its first full-scale tethered hovering flight.

A second milestone achieved recently is our building of UTM solutions and services. Airbus continues to directly support and build UAS integration solutions with regulators around the world. Recently Airbus was approved as an FAA low-altitude authorization notification capability, or LAANC, service supplier providing automated flight authorizations to operators near airports.

We are also working on exploring tomorrow’s UAM passenger experience today. Airbus’ UAM on-demand helicopter booking platform called Voom is busy enhancing current UAM operations in both Brazil and Mexico, and is actively pursuing a launch in the U.S. market this year. To date, the Voom booking platform has enabled thousands of passengers to request a seat on a helicopter within minutes.

Finally, we have been responding to critical policy and regulatory gaps with solutions. Airbus UAM is actively working with industry to set performance-based standards for future UAM operations and collaborating with governments on rulemaking efforts to identify solutions for aerospace access, protect and avoid technology, spectrum and communications, and more.

At Airbus we are committed to transforming our cities and towns by developing safe UAM solutions that offer a sustainable complement to ground transportation. We believe our work is meaningful only if it improves our cities and the way we live. Our solutions are focused on helping people save time, on better connecting cities and regions, and on reducing emissions.

Personally, one of the things that really inspires me to be here is ever since I was around the age of 10, I have had a love of flying. I built several RC aircraft with my dad. I flew them in our backyard, and it has been part of who I am as an adult. I knew I wanted to be an aerospace engineer since I was a little kid, and that has been my focus my entire life. And I am really excited to share my passion for flight by building UAM, which has the potential to inspire the joy of flight for everyone.

Thank you again for inviting me here to be a part of today’s hearing on behalf of Airbus. I look forward to answering the Committee’s questions. Thank you.

[The prepared statement of Mr. Lovering follows:]

PREPARED STATEMENT OF ZACH LOVERING, VICE PRESIDENT, URBAN AIR MOBILITY SYSTEMS, AIRBUS

Good morning Chairman Wicker, Ranking Member Cantwell, and members of the Committee. Airbus is honored to participate in today’s important hearing on new entrants in the aerospace market and we appreciate your interest in the future of our industry. We look forward to sharing Airbus’ vision for Urban Air Mobility (UAM) and providing a brief overview of our efforts to safely integrate new aircraft into the National Airspace System (NAS).

My name is Zach Lovering and I’m a senior member of Airbus’ UAM team based here in the United States. I joined Airbus three years ago as a Chief Engineer and then Project Executive leading the development of Vahana, a self-piloted electric vertical take-off and landing (eVTOL) demonstrator aircraft. In my current role as Vice President, UAM Systems, I lead the teams that are integrating all the individual systems, like air traffic management, vehicles, and infrastructure, into a single mobility framework, to ensure our UAM vision fully lives up to its promise.
About Airbus

Airbus is a pioneer in the global aerospace industry and has a major presence in the United States. We design, manufacture, and deliver industry-leading commercial aircraft, helicopters, military transports, urban mobility systems, unmanned aircraft systems (UAS), satellites and launch vehicles, as well as provide data services, navigation services, secure communications, and other solutions for customers on a global scale.

More than 50 years ago, Airbus opened its first production line in Grand Prairie, TX and today operates three other major production facilities in Mobile, Alabama; Columbus, Mississippi; and Exploration Park, Florida. Airbus spends approximately $15 billion each year with U.S.-based suppliers in over 40 states, supporting more than 275,000 U.S.-based jobs. Over the next 12 months, Airbus plans to add 1,000 new jobs and invest approximately $500 million in new facilities.

Airbus UAM

In addition to our growing business in the U.S., Airbus’ teams in California, New York, Oregon, and Washington D.C. are working to build sustainable and safe UAM solutions to transform our local communities for the better. In June 2018, Airbus created a Unit to lead its global UAM activities across the company. Airbus Urban Mobility is focused on on-demand mobility, unmanned traffic management, infrastructure and community integration, industry partnerships, and government regulations. The Unit also steers the development of Airbus’ ongoing eVTOL technology demonstrators Vahana, a small tilt-wing self-piloted eVTOL, and CityAirbus, a multi-passenger self-piloted eVTOL. By 2030, over 60 percent of the world’s population will live in urban areas and we believe our UAM solutions can help cities cope with this massive population growth and better connect our urban, suburban and rural communities. For Airbus, UAM is not just about developing new vertical take-off and landing vehicles. In some ways, that’s the achievable part for a company like Airbus with deep experience designing, manufacturing, and certifying aircraft. The real challenge is safely and securely integrating this new class of vehicles in the urban environment with public and regulatory acceptance.

By pushing the limits of technology in the fields of connectivity, artificial intelligence, autonomous systems, and electric propulsion, our aim is to create a seamless multi-modal air and ground transport network for cities. Emerging technology such as digital design and manufacturing, automated composite production, and 3D printing, will allow us to build and test UAM vehicles efficiently and affordably. Advanced avionics and new approaches to air traffic management are maturing and will be used to further safety and efficiency for unmanned airspace operations in the NAS. Citizens today are increasingly connected and welcome on-demand services to better navigate congested cities. This on-demand and sharing economy is encouraging us to explore business models to realize the future potential of UAM today.

The challenge of making UAM a reality is bigger than any one company. And ensuring this industry lives up to its promise will require the collaboration of stakeholders inside and outside of the aerospace community.

Over the last few years, Airbus has made steady progress on our efforts to reimagine how aviation safely integrates into the NAS. To date, Airbus Urban Mobility is focused on demonstrating safe UAM vehicles, building unmanned traffic management (UTM) solutions and services, enabling city integration through infrastructure design, exploring tomorrow’s UAM passenger experience today, and responding to critical policy and regulatory gaps with solutions. Some recent milestones include:

- **Demonstrating Safe UAM Vehicles:** Since January 2018, Vahana has been flying a full-scale demonstrator at the Pendleton UAS Test Range in Eastern Oregon. After nearly 60 full scale flights and over 1000 subscale flights, it has recently proven its capability to take off vertically and then transition to full-wingborne flight, marking the completion of its nominal flight test program. In addition, CityAirbus has recently completed its first full-scale tethered hovering flight.

- **Building UTM Solutions & Services:** Airbus continues to directly support and build UAS integration solutions with regulators around the world. Recently, Airbus was approved as a Federal Aviation Administration (FAA) Low Altitude Authorization and Notification Capability (LAANC) service supplier providing automated flight authorizations to operators near airports.

- **Exploring Tomorrow’s UAM Passenger Experience Today:** Airbus’ UAM on-demand helicopter booking platform called Voom is busy enhancing current UAM Operations in both Brazil and Mexico and is actively pursuing a launch in the
U.S. market this year. To date, the Voom booking platform has enabled thousands of passengers to request a seat on a helicopter within minutes.

- **Responding to Critical Policy & Regulatory Gaps with Solutions:** Airbus UAM is actively working with industry to set performance-based standards for future UAM operations, and collaborating with governments on rulemaking efforts to identify solutions for airspace access, detect and avoid technology, spectrum and communications, and more.

**Airbus UAM Value Chain**

Airbus is exploring a portfolio of safe and secure products and services, because we believe that UAM is about more than just the vehicle. This Airbus UAM value chain includes, but is not limited to, vehicle development, UTM solutions and services, community integration and infrastructure, and passenger experience.

**Demonstrating Safe UAM Vehicles—CityAirbus & Vahana**

Vahana is a demonstrator focused on advancing self-piloted, eVTOL flight. We envision Vahana being used by travelers and everyday commuters as a cost-comparable replacement for short-range city transportation methods like cars or trains. It uses eight electric motors and a tilt-wing configuration to enable both hover and cross-city range on battery power alone. A core premise of this demonstrator is that self-piloted operations will allow us to achieve higher safety and will also allow more vehicles to share the sky. Vahana follows predetermined flight paths with only minor deviations if obstacle avoidance is needed. Also, this vehicle could be used to transport heavy cargo, as a medevac service, or even to deploy emergency operations centers at disaster sites.

On January 31, 2018 Vahana successfully completed its first full-scale flight test, reaching a height of 16 feet (5 meters) before descending safely. Since then, we’ve completed nearly 60 successful test flights at the Pendleton UAS Test Range that include all flight tests associated with the mission we intended to perform at the outset of the project. Additional tests are being conducted as we speak to study maneuvering capabilities, noise, and the self-piloted hazard detection features. The ability to test here in the U.S. is critical to maturing the vehicle and we applaud Congress for their continued focus on UAS research and test sites.

In addition to Vahana, Airbus has another demonstrator called CityAirbus. CityAirbus, is a self-piloted eVTOL designed to carry up to four passengers over cities in a fast, affordable, and environmentally friendly way. CityAirbus will transport passengers on fixed routes from hub to hub (e.g., city to airport or vice versa). In May 2019, the team completed their first tethered hovering flight.

**Building UTM Solutions & Services**

The aerospace industry is moving quickly to innovate with new aircraft types, sizes, and flight capabilities. In 2017, the number of registered UAS in the U.S., including both commercial and consumer, eclipsed one million—more than double the number of general aviation aircraft in the U.S. To support this growth, a more modernized and scalable solution to airspace management is needed.

Through research, simulations, and industry collaboration, Airbus is building digital air traffic management solutions to enable the next age of aviation. Under the umbrella of Airbus Urban Mobility, our UTM team is designing, developing, and building the solutions necessary to allow these new aircraft, including new UAM vehicles, to safely integrate into the NAS. Airbus’ UTM solutions are already beginning to integrate with today’s Air Traffic Management (ATM) through efforts like the FAA LAANC program to help UTM service providers such as Airbus provide FAA authorizations for flights near airports. Our UTM solutions are also being used to enable beyond visual line of sight operations and advanced use cases like package delivery.

In September 2018, Airbus released “Blueprint for the Sky”, a roadmap for the safe and efficient integration of UAS and other self-piloted aircraft into our airspace. The document outlines policies that can help government regulate new operations and ensure that air transport remains as safe tomorrow as it is today. The Blueprint was reviewed by leading industry experts from the Massachusetts Institute of Technology, the National Air Traffic Controllers Association, Stanford University, the World Economic Forum and more.

**Enabling Community Integration through Infrastructure Design**

The Airbus Urban Mobility Unit is also actively exploring mobility solutions to enhance a city’s existing network for the benefit of its citizens and determining what additional infrastructure, like takeoff and landing areas (e.g., vertiports), would be required. By using city-level data and powerful modelling tools, Airbus can simulate
Exploring Tomorrow’s UAM Passenger Experience Today

Through its in-market booking platform Voom, Airbus provides an on-demand helicopter mobility service that allows passengers to request a seat on a certified helicopter within minutes. Voom has provided thousands of passengers the opportunity to fly efficiently in congested cities and is laying the groundwork for Airbus’ longer-term vision of UAM using eVTOL vehicles supported by the necessary infrastructure. Voom has proven to be a fantastic mechanism to glean key insights into the potential of the on-demand air mobility market and passenger preferences, and Airbus Urban Mobility is collecting those insights to advance vehicle development.

Voom currently offers its services in São Paulo and Mexico City, and is exploring expansion in the U.S. soon. By providing a more efficient transportation option to daily commuters, Voom aims to address mobility challenges in some of the world’s most congested cities.

For the foreseeable future, the cost of helicopter travel can be better optimized. This is why we are exploring other types of UAM vehicles and operations to lower costs and enable future city dwellers the ability to affordably take advantage of UAM. Over time competition and will lower costs and allow UAM to evolve into a broad solution for a diverse set of passengers.

Responding to Critical Policy & Regulatory Gaps with Solutions

As we explore the full value chain to build UAM solutions and services, we are leaning into the many policy and regulatory areas this innovation can impact. Our team is actively working on solutions across a plethora of policy areas including but not limited to certification, safety & security and public acceptance.

- **Certification:** Promulgated in 2016, the “Revision of Airworthiness Standards for Normal, Utility, Acrobatic, and Commuter Category Airplanes” (or Part 23) is a key enabler and viable pathway to certifying UAM aircraft in the U.S. The revision “provides greater flexibility to applicants seeking certification of their airplane designs, and facilitates faster adoption of safety enhancing technology in type-certificated products while reducing regulatory time and cost burdens for the aviation industry and FAA”.
- **Safety & Security:** Airbus’ dedication to safety is reflected across the company’s approach to build UAM solutions to connect our urban, suburban and rural communities. Our approach to UAM Security is directly inherited from the company’s experience in managing security for large aircraft and helicopters. Our approach is risk based, holistic and will extend through the lifecycle of our UAM products including supply-chain and manufacturing.
- **Public Acceptance:** Buy-in from regulators and local communities is critical to scaling UAM and advancing UAS operations. Airbus is a proud participant of the FAA’s Integrated Pilot Program (IPP) with North Dakota and Virginia, and leader of the UAM Initiative of the European Innovation Partnership on Smart Cities and Communities. These community-centric and citizen-driven initiatives help governments and the private sector better address local concerns well in advance of scaled operations.

Conclusion

At Airbus, we’re committed to transforming our cities and towns by developing UAM solutions that offer a sustainable complement to ground transportation. We believe our work is meaningful only if it improves our cities and the way we live. Our solutions are focused on helping people save time, on better connecting cities and regions, and on reducing emissions.

Thank you again for inviting me to be part of today’s hearing on behalf of Airbus. I look forward to answering the Committee’s questions.

The **Chairman.** Mr. Lovering, I found model airplanes frustrating as a boy.

[Laughter.]
The CHAIRMAN. I moved in a different direction.

Mr. LOVERING. I have crashed quite a few of them myself.

The CHAIRMAN. Mr. Stallmer.

STATEMENT OF ERIC STALLMER, PRESIDENT, COMMERCIAL SPACEFLIGHT FEDERATION

Mr. STALLMER. Thank you, Senator. Chairman Wicker, Ranking Member Cantwell, and distinguished members of the Committee, thank you for inviting the Commercial Spaceflight Federation to summarize the state of the U.S. commercial space industry and highlight our members’ engagement on airspace optimization and regulatory reform issues.

CSF members are responsible for the creation of many thousands of high-tech jobs driven by billions of dollars of investment. Today’s commercial space transportation industry is growing in frequency of operation and diversity of capabilities. More launches and reentries entails more efficient integration of space flight into the national airspace system, requiring coordinated efforts between the U.S. Government and industry to find the solutions that mitigate impacts while preserving safety.

Because the NAS is a shared public resource, it is open to all. CSF is actively working with other NAS users to promote the new airspace tools and operational improvements that will optimize the use of the NAS in a safe and efficient manner. Those efforts are the major focus of my testimony today.

As already noted, 32 commercial launches and 14 reentries transited the NAS in 2018. To put that in perspective, in a given year approximately 15.5 million flights operate in the NAS. So while 32 is a significant increase over the 12 launches that we had just 5 years ago, we have a long way to grow to become even 1 one-thousandth the size of aviation.

Unfortunately, the obsolete approach that we use to protect the air traffic from space launches and reentries can have an outsized impact on aviation. Specifically, the FAA uses decades-old analysis and air traffic control tools to segregate the airspace around a launch or reentry. Simply stated, we close too much airspace for too long without providing real-time information about the launch and reentry to the air traffic controllers. Instead of closing large blocks of airspace for hours, we could close smaller blocks that move along with the space vehicles.

To fix this, we need to solve these problems. Obsolete tools that dictate a safety area around a launch or reentry are too conservative and cannot update during flight, the air traffic control systems that cannot accept data on the position and velocity of the space vehicles and a lack of tools for space operators to share and compare their launch and reentry schedules to the aviation schedules to minimize conflicts. We are eager to work together across industry to address these challenges. In fact, we already have.

Since early 2018, I have co-chaired the FAA’s Aviation Rulemaking Committee, or ARC, on airspace access with representatives from the airlines, the pilots, airports, business aviation, and many other stakeholders, plus large and small commercial space operators and spaceports. While it was initially suggested that we try to prioritize aviation and space activities, we quickly decided
that we needed to optimize our use on the shared resource rather than cut back on either sector’s growth. Since then, we have come a long way and our final report should be ready in the next few months.

CSF’s own priorities for actions and investment that the FAA should pursue in collaboration with industry align well with much of the work we have done with the ARC. My written testimony identifies numerous tasks that the FAA should undertake, but let me try to boil it down to just one summary proposal.

The FAA must immediately develop and implement tools and capabilities that transform air traffic management during launch and reentry from segregation to integration with separation assurance. As NAS users from aviation and space have worked together over the last year, we see that accelerating next generation air transportation systems, or NextGen, is central to achieving a more integrated and safe and efficient use of the NAS. The ARC’s recommendations, once released, must be pursued expeditiously as NextGen priorities. They cannot be added to a long list of to-dos that will take a decade or more to complete. The FAA needs to utilize other transactional authorities and other innovative procurement methods to dramatically accelerate these critical improvements to airspace management.

The goal from the CSF perspective is to get the FAA to the point where it can adapt, move, and innovate quickly enough to keep up with the advancements of the traditional piloted aviation, commercial space flight, and other NAS users. Given the importance of aviation to our space and our economy, our freedom, and our national security, we have to find a way for the FAA to move much faster and get ahead of industry rather than struggling to catch up.

In my written testimony, I have provided an update on the status of the NPRM to streamline the launch and reentry regulations that General Monteith had touched on and also discussed the value of suborbital platforms supporting national STEM and workforce development priorities.

In conclusion, these are exciting times in commercial space flight. We should all be proud of what American companies are achieving. The challenges we face today are not small, but we have the opportunity and the ability to solve them in a thoughtful and timely manner. We look forward to continuing to work with you to promote the safety, increased access to space, and the advancement of the commercial space industry.

Mr. Chairman, Ranking Member Cantwell, I appreciate your invitation to testify before the Committee today. Thank you for your attention. I look forward to any comments or questions you may have.

[The prepared statement of Mr. Stallmer follows:]

PREPARED STATEMENT OF ERIC STALLMER, PRESIDENT, COMMERCIAL SPACEFLIGHT FEDERATION

Chairman Wicker, Ranking Member Cantwell, and distinguished members of the Committee: thank you for inviting the Commercial Spaceflight Federation (CSF) to present our members’ views on the state of the U.S. commercial space industry. We also appreciate the opportunity to highlight our members’ engagement with various regulatory reform efforts that are underway and other policy issues facing our industry.
CSF is the leading national trade association for the commercial spaceflight industry, with more than 85 member companies and organizations across the United States. Founded in 2006, CSF is focused on laying the foundation for a sustainable space economy and democratizing access to space for scientists, students, civilians, and businesses. CSF members are responsible for the creation of thousands of high-tech jobs driven by billions of dollars in investment. Through the promotion of technology innovation, CSF is guiding the expansion of Earth’s economic sphere, bolstering U.S. leadership in aerospace, and inspiring America’s next generation of engineers and explorers.

Prior to our country’s successes over the last decade in capturing a majority share of the commercial space launch market, the majority of launches in the United States were undertaken by the U.S. Government. With increased commercial launch and reentry activities the need to more efficiently integrate our activities into the National Airspace System (NAS) has led to coordinated efforts within the U.S. Government and industry to find solutions that mitigate impacts while promoting safety. Of course, since rockets and balloons predate airplanes, these are not new entrants to the NAS, simply a changing economic landscape that is vibrant, growing, creating jobs and establishing American leadership. This economic growth leads some to believe that an obsolete NAS will become congested, inefficient, and perhaps less safe.

Because the NAS is a shared public resource, we are eagerly working with other NAS users to promote technology tools and operational improvements that will optimize the use of the NAS in a safe and efficient manner. Those efforts are the major focus of my testimony today.

I. Commercial Space Today

This year, the United States commercial space industry is poised for another record-setting year. Last year, U.S. commercial space companies achieved an unprecedented 32 licensed orbital and suborbital launches as well as 14 licensed reentries. The majority of those licensed activities were attributable to SpaceX, which conducted 21 launches that involved 12 first stage landings. 2018 also saw the first commercial launch of Rocket Lab’s Electron, and the first licensed flights to space of two American suborbital reusable launch vehicles, Blue Origin’s New Shepard and Virgin Galactic’s SpaceShipTwo. I emphasize the word licensed, because a license allows the company to earn revenue from the flight, unlike an experimental permit.

Today’s commercial space transportation industry is growing in frequency of operation and in the diversity of capabilities offered. In addition to smaller suborbital launch vehicles and medium, heavy and super-heavy-lift launch vehicles, many of which are reusable, we now have a broad range of smaller orbital launchers entering the marketplace to give smaller satellites a dedicated ride to space.

This year the U.S. conducted a successful flight qualification mission of the first of two independent commercial crew vehicles being developed in partnership with NASA, and we expect to see another this fall. Two suborbital operators are likely to fly spaceflight participants for revenue by the end of the year. With a lot of hard work and some luck, U.S. astronauts will launch to the International Space Station again from U.S. soil in the next twelve months. As of today, we have already had 11 commercial launches this year.

Much of this progress may seem sudden, but is the culmination of years of policy work in Washington and high-tech manufacturing efforts across the country. Blue Origin was founded in 2000, SpaceX in 2002, and Virgin Galactic in 2004. Vector Space’s innovative small launch vehicle has its roots in many years of amateur rockets built and launched by university students. These companies and many others are in fact decade-plus “overnight successes” facilitated by efforts to provide a regulatory environment that is focused on protecting the uninvolved public without stifling the industry.

II. Optimizing the Transit of Airspace by Launch/Reentry Operators

In the past few years, the increasing frequency of space launch and reentry activities, along with the emergence of new entrants to aviation, has raised congestion and safety concerns among some traditional aviation stakeholders. It is important, though, to keep the number of launches and reentries in context with the level of aviation activity in the NAS. As already noted, there were 32 commercial launches and reentries that transited the NAS in 2018. In a given year, approximately 15.5 million flights transit the NAS. So while 32 is a significant increase over the 12 launches 5 years ago, it is barely a blip on the radar.

While there has been great progress in traditional aviation and commercial space transportation, like new entrants, drones, and personal air vehicles—all good and
desirable developments—that progress is highlighting the need to improve the hardware, software, and human systems that manage the NAS. In particular, the way that we restrict airspace around launch or reentry events—an approach called “segregation”—is an inefficient use of the airspace.

Historically, going back to the 1960s with the dawn of the space age, we closed large blocks of airspace around launches to keep airplanes and their crew and passengers far away from any potential catastrophic accident. Today we should be capitalizing on improved modeling and airspace control capabilities, instead, we continue to use out-dated approaches and systems that look essentially the same as those used in the 1960s. Those systems do not reflect the diversity of vehicles and operations that exist today, much less the innovation and industry expansion we expect over the next decade.

The problem is with the space launch risk analysis and air traffic control tools that the FAA uses to close airspace. Those tools are decades old, and not designed for today’s aviation or space transportation needs. Stated simply, we close too much airspace, for too long, without real-time information available to air traffic controllers regarding the status of the launch or reentry. To improve the situation, we need to invest in fixing the following problems:

- Obsolete tools that dictate the safety area around a launch or reentry—they are overly conservative and not dynamic;
- The air traffic control systems’ inability to accept data on the position and velocity of space vehicles; and
- The lack of a tool for space operators to share and compare their launch and reentry schedules to aviation schedules to minimize conflicting operations.

We are eager to work together across industries to address these challenges.

III. To Successfully Integrate Launch and Reentry Operations into the NAS, the Following Tools are Necessary

Instead of closing large blocks of airspace for hours, it should be possible to dynamically manage air traffic around a launch or reentry. That requires real time safety area calculation and information flow, including the current position and velocity of the launch vehicle, to individual en route air controllers, so they can release airspace immediately behind the launch vehicle as it flies.

Since early 2018 I have co-chaired the FAA Aviation Rulemaking Committee (ARC) on Airspace Access with representatives of airlines, pilots, airports, business aviation, and many other stakeholders, plus many large and small commercial space operators and the most active spaceports. While the FAA originally wanted us to attempt to prioritize aviation and space uses of the airspace, we quickly realized that we needed to integrate and optimize our use of the shared resource rather than cutting back on either sector’s growth.

I won’t tell you that the past year and a half has been easy. Leaders in both industries have often struggled to understand each other’s priorities and perspectives, and even our respective vocabularies. But with that said we have come a long way, and our final report should be ready in the next few months.

More specifically, CSF recommends the following actions and investments by the FAA in collaboration with industry, which aligns well with a lot of the work we’ve done in the ARC. The FAA should:

1. Immediately emphasize and accelerate efforts to efficiently integrate space vehicle operations into the NAS.
2. Establish a space operations committee (including operators, Department of Defense, and NASA) to recommend appropriate information to be exchanged with the FAA for more dynamic airspace management and situational awareness.
3. Establish a Steering Committee to provide ongoing input to the FAA as NAS improvements are developed and implemented.
4. Invest in developing tools and capabilities that will enable a future NAS state where air traffic management shifts from segregation to integration with separation assurance.
5. Implement the ability to create dynamic airspace areas on controller automation systems that can be conflict probed.
6. Implement decision support tools in automation systems for air traffic controllers and traffic managers.
7. Develop procedures and training to enable future automation capabilities.
8. Further develop its Hazard Risk Assessment and Management (HRAM) capability and make that tool available to ATC to allow for dynamic airspace management.

9. Implement and enable a capability, such as the Space Data Integrator (SDI) that allows space operators to share telemetry data with ATC systems and use that tool to supply telemetry to HRAM and other automation platforms as necessary.

10. Implement a NAS operational airspace utilization assessment for both planning and post analysis capability and make it available to operators online.

11. Require minimum advanced notification times prior to an event requiring Special Access Airspace (SAA).

12. Ensure sharing of real-time status of the vehicle for both pre-and post-launch.

13. Implement procedure updates for tactical information exchange between operators and FAA regarding on-time operations to enable more dynamic airspace activation/deactivation.

As the NAS using industries have begun working more closely together, it is clear that the Next Generation Air Transportation System, or NextGen, is central to a more integrated, safe, and efficient use of the NAS. The recommendations I just enumerated are an obvious part of the NextGen portfolio. But it is not sufficient to just add them to a to-do list that will take a decade or more to complete. The FAA needs to utilize its Other Transactions Authority (OTA) and other innovative procurement methods to dramatically accelerate these critical improvements to airspace management.

While these tools are being developed, there are things that space operators can do to help aviation operators minimize system delays during launch and reentry events. If FAA/AST were to create an integrated schedule of licensed or permitted launches and reentries, industry could authorize FAA/AST to share much of that information a few months, rather than about ten days, with aviation operators. The benefit of earlier notice is that aviation operators can still reallocate their crews and airplanes to create some slack in higher value scheduled flights that are more vulnerable to delays.

Ultimately, however, the challenge is getting the FAA to the point where it can adapt, move, and innovate quickly enough to keep up with the advancement of aviation, commercial spaceflight, and new NAS entrants. Given the importance of aviation and space to our economy, our freedom, and our national security, we have to find a way to help the FAA to move much faster and get ahead of industry, rather than struggling to catch up.

IV. Scaling Launch and Reentry Regulation

Today's launch and reentry rates, together with innovative operations and increased industry diversification, are bringing to light new challenges. The first of these is the obsolete, burdensome, and duplicative body of regulations for launch and reentry. Today's rules were mostly crafted in the 1980s and 1990s, and they take a very narrow, prescriptive approach that does not support innovation in technology and operations, including changes that improve safety, efficiency and industry growth.

Thanks to leadership from the President, Vice President, National Space Council, Secretary of Transportation, and senior FAA officials, a much-needed reform process has begun. Last March an Aviation Rulemaking Committee (ARC) was chartered on Streamlining Launch and Reentry Licensing Requirements. This was critical because many industry experts believed that the best way to rewrite these regulations would be via a negotiated rulemaking.

The resulting Notice of Proposed Rulemaking (NPRM) to streamline the launch and reentry regulations is now open for comment. The goals for the NPRM were outlined in Presidential Space Policy Directive No. 2 (SPD–2). It stated, in part:

The Secretary of Transportation shall consider the following:

(i) requiring a single license for all types of commercial space flight launch and re-entry operations; and

(ii) replacing prescriptive requirements in the commercial space flight launch and re-entry licensing process with performance-based criteria.

Importantly, neither SPD–2 nor the resulting NPRM has changed the level of safety applied to spaceflight activities. Nobody in industry (or government) is asking for a lower level of safety. The goal of SPD–2 and the NPRM is only to streamline the regulatory process and create a performance-based approach to regulating an innovative, evolving industry while making it even safer.
We complement the FAA for getting the proposed rule out fairly quickly, delayed only by the government shutdown. Unfortunately, instead of a giant leap, the FAA seems to have taken only a half step towards the regulatory regime America needs to enable the growth and diversity of new space transportation providers and users. The 580-page NPRM grants industry 60 days to provide comments, which might be possible if the industry’s input through the ARC were more fully reflected in the NPRM, and if all referenced material were included (advisory circulars are referenced but not provided). Unfortunately, inputs that reflected the position of a majority of industry members were not included; therefore, many CSF members have requested an extension of the comment period to fully review and provide substantive comments and recommendations.

In assessing the NPRM so far, the draft rule fails to achieve the key objectives of SPD–2 and industry’s highest priority: streamlined, performance-based rules that accommodate all licensed launches and reentries at all operating locations, including Federal ranges.

Historically, AST’s regulations have been very specific and prescriptive for expendable launch vehicles. The regulations have taken a more general approach for reusable vehicles that examines the safety of the system as a whole. The rules for expendable rockets were written that way partly because they were based on, or referenced, the Air Force’s detailed procedures at the Federal ranges, which go back to the days of the earliest ballistic missiles.

Importantly, the ARC had stipulated in its report that the FAA needed to rewrite the terms of their partnership with the Air Force to meet Congress’ and industry’s call for singular regulatory authority for public safety that would apply the same approach to launch sites on Federal ranges and those in other locations. The ARC’s recommendations reflect Congressional action on this issue in recent legislation, including the Commercial Space Launch Competitiveness Act (CSCLA) of 2015 and the 2018 National Defense Authorization Act. Under the CSLCA, the Department of Transportation is supposed to have sole Federal jurisdiction over space launch and reentry. The Air Force (USAF), acting as a landlord, can prescribe safety rules for ground operations, but is not supposed to have duplicative authority or promulgate duplicative (and potentially conflicting) regulations. The NPRM does not address duplicative requirements imposed by the USAF on commercial space operations.

CSF members believe it would be tremendously helpful if the FAA were to reconvene the ARC to provide feedback on the NPRM, currently the FAA has said it has no plans to do so. To be sure, industry appreciates all of the support for regulatory reform from so many policymakers in Congress and the Executive Branch, and we do thank the FAA for their incredible hard work over the past year-plus with the ARC and the draft rule. We are hopeful that our requests for more time to review and comment will be granted. The importance of this rulemaking process cannot be overstated and we are ready to engage to ensure that the rules are optimized for protecting the public and ensuring an efficient launch and reentry licensing regime.

V. Suborbital Platforms Support National Priorities

Recently, a few public critics have written off suborbital reusable launch vehicles’ operations in the NAS as just providing adventure rides for millionaires. Nothing could be further from the truth. Commercial suborbital platforms aren’t a nuisance to the Nation or the NAS; they’re a national asset, supporting national priorities. According to the National Academies of Science, “[S]uborbital [platforms] play a vital and necessary strategic role in NASA’s research, innovation, education, employee development, and spaceflight mission success, thus providing the foundation for achievement of agency goals.” This principle has application and implication that extends beyond NASA, and extends to national priorities and goals. More specifically, the growing number of commercial launch platforms:

1. Expand hands-on STEM engagement and training for students;
2. Enhance scientific understanding of the Earth and the Universe;
3. Increase hands-on training opportunities and workforce development experiences for the next generation of space scientists and engineers;
4. Improving program management by flight-testing new technologies and techniques relatively inexpensively;
5. Expand economic activity—Creating a pipeline for commercial economy Low-Earth Orbit (LEO) and on the International Space Station (ISS);

Expand hands-on STEM engagement and training for students. The growing number of commercial space companies providing cost-effective and frequent access to the spaceflight environment is making it easier for students to participate in hands-
Increase hands-on training opportunities and workforce development experiences for the next generation of space scientists and engineers. The growing number of commercial space companies providing cost-effective and frequent access to the spaceflight environment is enabling a greater scientific understanding of our Earth and the universe. For example, commercial suborbital platforms are enabling scientists to better study and understand the Earth’s upper atmospheric conditions (90 kilometers and above), which we know little about due to lack of access to this region, which was too high for balloons and too low for spacecraft. In fact, we know more about the upper atmosphere of Saturn’s moon, Titan. Now, commercial suborbital vehicles are enabling new scientific study of that region, along with other areas. Overall, the National Academies of Science has found, “[S]uborbital [platforms] enable important discoveries in science, rapid response to unexpected, episodic phenomena, and a range of specialized capabilities that enable a wide variety of cutting edge research in areas such as Earth observations, climate, astrophysics, and solar-terrestrial observations, as well as calibration and validation of satellite mission instruments and data.”

This point was driven home in a recent NASA Office of Inspector General report outlining key factors contributing to NASA’s project management challenges.

2 See: Purdue University, “Purdue School Launchboxes available to send school experiments into space,” July 2018. Available at: https://www.purdue.edu/newsroom/releases/2018/Q3/purdue-school-launchboxes-available-to-send-school-experiments-into-space.html
5 See Tim Fernholz, “Three minutes of microgravity is worth the cost of a small house, if you’re a scientist.” Quartz, January 12, 2018. Available at: https://qz.com/1174480/blue-orbital-platforms-send-school-science-into-space-for-three-minutes-and-thats-a-game-changer/
“[M]ost [NASA] project managers and senior officials we spoke with said that experience and on-the-job training were keys to a project manager’s ability to manage cost, schedule, and performance goals. In that regard, managers described NASA’s small projects [e.g. NASA’s Flight Opportunities Program] as invaluable for developing management skills and learning the key elements of project management, including making appropriate trade-offs among cost, schedule, and performance goals when necessary.”8

Improve program management by flight-testing new technologies and techniques relatively inexpensively. The growing number of commercial space companies providing cost-effective and frequent access to the spaceflight environment is improving program management by flight-testing new technologies and techniques relatively inexpensively. The National Academies of Science has found, “[S]uborbital [platforms] provide essential technical innovation and risk mitigation that benefit spaceflight missions through the development and demonstration of technology and instruments that later fly on NASA spacecraft.”9

The importance of early technology risk reduction through flight-testing was driven home in a recent NASA Office of Inspector General (OIG) report outlining key factors contributing to project management challenges: “The technical complexity inherent in NASA projects remains a major challenge to achieving cost and schedule goals, with project managers attempting to predict the amount of time and money needed to develop one-of-a-kind, first-of-their-kind technologies, instruments, and spacecraft. NASA historically has underestimated the level of effort needed to develop, mature, and integrate these technologies, as well as account for the extensive pre-launch testing required to reduce risk and increase the likelihood that the technologies will operate as designed in space.”10 Increased flight-testing on low-cost commercial suborbital platforms will help address this problem.

Expand economic activity—creating a pipeline for commercial economy Low-Earth Orbit (LEO) and on the International Space Station (ISS). One of the Nation’s top priorities is to facilitate a robust, sustainable U.S. commercial presence in LEO and on the ISS, which is underpinned by the need for a growing sphere of microgravity economic activity. Commercial suborbital capabilities play a critical role in creating this microgravity demand pipeline by providing low-cost platforms to conduct vital technology development and research. Any successful strategy to create a robust economy in LEO should position commercial suborbital capabilities as a critical component.

Conclusion

These are exciting times in commercial spaceflight. We should all be proud of what American companies are achieving—we are establishing our Nation as the clear leader in space exploration and development. The challenges we face today are not small, but we have the ability and opportunity to address them in a thoughtful and impactful manner given Congress’ and the Administration’s support.

As we prepare to celebrate the 50th anniversary of the Apollo 11 moon landing, CSF members are honoring the past by working to fully realize a revolution in access to space that will open the space frontier to the American people and their enterprises. We look forward to continuing to work with this body to promote safety, reliability and the advancement of the commercial space industry.

Mr. Chairman, Ranking Member Cantwell, I appreciate your invitation to testify before the Committee today. Thank you for your attention, and I look forward to your questions.


APPENDIX

The Commercial Spaceflight Federation's (CSF) FY 2020 Transportation, House and Urban Development (THUD) Appropriations Priority Requests

Project Title: Office of Commercial Space Transportation (AST)
Agency: FAA
Account: Operations
Request Amount: $25.6M
Report Language:
The Committee directs the Office of Commercial Space Transportation to continue to prioritize licensing and regulatory streamlining activities. The Committee urges the Associate Administrator to complete negotiations with the Department of Defense to ensure that the Secretary of Transportation will be responsible for public safety during licensed and permitted launch and reentry operations on Federal ranges, with the Department of Defense maintaining responsibility for public safety during ground operations.

Project Title: Commercial Space
Agency: FAA
Account: Facilities and Equipment
Request Amount: $33M
Report Language:
Continuing growth in the U.S. commercial space industry requires the urgent modernization of decades-old methodology for maintaining public safety in airspace around commercial space launches and reentries. The Committee directs the Associate Administrators for NexGen and for Commercial Space Transportation to work collaboratively and exercise the FAA’s broad authority to use other transactions and other innovative partnership methods to accelerate the development and certification of tools for en-route real-time tracking, calculation and display of the flight path and dynamic hazard areas for space launch and reentry activities on air traffic controller screens.

Project Title: Commercial Space Transportation Safety
Agency: FAA
Account: Research, Engineering and Development
Request Amount: $6M

Project Title: Space Transportation Infrastructure Matching (STIM) Grants Program
Agency: FAA
Account: Space Transportation Infrastructure Matching (STIM) Grants Program
Request Amount: $10M
Report Language:
The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) maintains the Space Transportation Infrastructure Matching (STIM) Grants Program for the purpose of ensuring the resiliency of the space transportation infrastructure in the United States. The U.S. Congress mandated the Grant Program under §51 Chapter 511 Space Infrastructure Matching Grants. This legislation authorizes the use of Federal monies in conjunction with matching state, local and private funds to complete technical and environmental studies and design and construction of space transportation infrastructure, including real property to meet the needs of the United States commercial space transportation industry.

The CHAIRMAN. Thank you very much to all of you. You sped through it and the vote has not yet begun. So we got a little time here.

Let me start with you, Mr. Brooks. I found it interesting that you speak approvingly of congressional mandates, particularly with regard to specific short-term deadlines. And you look askance at some bureaucratic requirements that you are compelled to comply with. So let me ask you to expand on this, and then I will see if anyone else on the panel wants to respond.

You say there are unnecessary layers. Give us examples of that. And you say it now takes up to six times longer—six times longer—
to approve UAS Center of Excellence research because of a recent policy change. What happened there and what do we need to do?

Mr. BROOKS. First, I will point out that the UAS Center of Excellence was the fastest standup of a center of excellence in history. We literally did it in about four and a half months from the date of award to our first contracts.

The CHAIRMAN. Good for you.

Mr. BROOKS. So we have been moving very, very, very quickly, and we tend to push on others to try to match our pace.

In this particular case, FAA had sole review for our research project’s approval, funding streams, things of that nature, and we could normally—once we decided on the content of a project, we could run that through the approval wickets in a matter of weeks.

Recently, there has been a move that the Department of the Transportation has now exercised their right to review all projects in all of the centers of excellence, and all of a sudden, our approval process has been delayed up to many months. So far, we have not seen any substantive changes due to this review. So I do question the value in the absence of some concrete examples of how they were made better. We know what we need to do. We need to do it quickly, and we are anxious to move forward to do that. And we think that one way to help is to remove some of these layers.

The CHAIRMAN. Were these being reviewed at the FAA level and then kicked up to——

Mr. BROOKS. They were previously reviewed and approved at the FAA level, and now they go through a second level of review at the Department level.

The CHAIRMAN. OK. Mr. Merkle, is that an unnecessary step, and do we need to fix that?

Mr. MERKLE. I would be happy to get with you and your staff and explain the details.

The CHAIRMAN. OK. But do the best you can in about 60 seconds.

Mr. MERKLE. As a recipient of the research of ASSURE, we are a sponsoring office and we are also one of the recipients of the ASSURE research, and we greatly benefit from what they do. So we too share the desire to be as effective and timely as possible. And sometimes the grant process, based on the number of grants being processed at any one time or the complexity of the grants, takes a little bit longer.

But again, as for all the details of the review process, I do not actually own that, but I would be happy to get back with you and explain it.

The CHAIRMAN. OK. Well, we have the testimony, verbal and written, that there is no discernible value added, but it is taking six times longer. That is the sort of thing that this committee might be able to help with as a matter of oversight. But I am sure there are people on the other side who think this is valuable and contributing to safety.

Mr. MERKLE. There are.

The CHAIRMAN. So, Mr. Brooks, what works and what does not work? Can you give us an example of finding something that does not work?

Mr. BROOKS. So to expand on one of my earlier comments, when you want to get something done quickly, you want a highly con-
fident streamlined team that is focused on an issue at a time. The SARP has done that, the Center of Excellence has done that, and a few other organizations have managed to solve some really big problems very quickly. As an old friend of mine used to say, when you try to boil the ocean, it takes a very, very long time.

And our initial approach years ago was to do just that. We would try to solve all the problems at once. We would build incredibly large committees, hundreds of people. And as you well know, past a certain critical mass, that completely stalls all innovation and momentum.

I think that we have proven through the SARP, through the Center of Excellence, and a few other great organizations that a concentrated effort, let us rack our problems, hit the top priority ones first with a concentrated effort and start moving down because those wins enable us to fly more and more. When we fly more and more, we collect more data. We understand what is truly safe. And so by focusing on specific problems like we did with the SARP, go tell us how closely an unmanned system can operate in proximity to another aircraft, what is safe and what is not.

The CHAIRMAN. What is the answer to that?

Mr. BROOKS. So for a small UAS operating in proximity to a manned aircraft, that is about 2,000 feet laterally, sir.

The CHAIRMAN. 2,000 feet laterally.

Mr. BROOKS. Yes.

The CHAIRMAN. Thank you very much.

Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. There are so many issues to discuss. So I thank the witnesses again for their testimony and illuminating how we move forward. I think someone could write a chapter just on this, how the Federal Government and innovation work together to move forward, because I think this is like just one of the early examples of how challenging this is going to be and how important it is to get it right. So everybody said very illuminating things. So thank you for that.

Switching to—well, let me start with space launch and the issues related to that. So, Mr. Monteith, how are we working to integrate these issues particularly as it relates to the Air Force and Air Force launching sites? Because the FAA, under Title 51, the Department of Transportation has sole Federal jurisdiction over space launch. The Air Force acting as a landlord has prescribed safety rules as well. So I want to make sure that we are unifying requirements in a process so that we can prioritize safety and make sure that we are getting all of this coordinated.

And how are we supposed to look at the commercial aviation implications? Obviously, launch activity takes place when it is ready. Right? And so you have weather conditions. You have issues, but shutting down the airspace also has implications. We had an incident in the Northwest where during one of our Presidential visits to the state, a float plane did not register and flew into Seattle airspace at the same time as the Presidential visit. And then there was the launch of the aircraft from Portland thinking that we were under some sort of potential threat. So we have had to work very hard to make sure that aviation industry was not impacted every
time a President came to Washington State. Being able to fly float planes in and out of Lake Washington is just pretty standard.

So this whole issue of how to integrate the commercial travel with space launch, which is not always predictable—so how do we get a more unified process here and get input from those individuals so that we are not shutting down airspace of commercial aviation travelers for three hours at a time?

Mr. Monteth. Senator Cantwell, thank you for the question.

I will take the second part first on the integration of commercial space into the national airspace. We also understand how important it is for everyone to be able to operate safely through the national airspace with minimal disruption to each mode of transportation.

With that in mind, we are working as an agency on a space data integrator which will, when fully implemented, will take the amount of time it currently takes to inform a flight crew that there is a hazardous operation—in this case, it would be an unexpected break-up in flight of a rocket vehicle, which is why we close down large portions of the airspace because debris may fall for up to 20 minutes. That process right now, because it is not automated, takes anywhere from 14 to 20 minutes. We are developing a program that will potentially eventually take that notification time to under a minute. Once you have that kind of dynamic management, you can close—or you reduce the amount of closures not only from a size perspective but from a time perspective because you do get that dynamic response and your telemetry is coming down in real time.

Senator Cantwell. I look forward to hearing more about this. I think the complexity here is going to be pretty great because, again, I just do not think people know exactly when you are going to launch. So I do not know if that means we are going to move to more remote locations as opposed to being in more dense population areas.

But I want to use my final minutes here. Mr. Merkle, do you think we are going to make this July 21 deadline for the remote identification rule?

Mr. Merkle. We are working toward that. We have dedicated a large number of resources to not only the rule but to developing the standards that support the rule and beginning to implement the infrastructure simultaneously. So we are working on the policy, the regulatory, the infrastructure build-out, which we have a request for information to build a cadre of industry to come in and partner with us to build it and also the standards.

Senator Cantwell. So the answer to that was yes.

Mr. Merkle. The answer is we are still working to that schedule, yes.

Senator Cantwell. Thank you.

STATEMENT OF HON. DEB FISCHER,
U.S. SENATOR FROM NEBRASKA

Senator Fischer [presiding]. Thank you, Senator Cantwell.

Mr. Merkle, section 2209 of the FAA Extension Safety and Security Act of 2016 directs the FAA to set up a process by which operators of fixed site facilities could petition the agency to prohibit UAS
operations over-critical infrastructure. And critical infrastructure includes fixed site facilities such as energy production and transmission facilities and railroads.

Can you provide an update on the FAA’s efforts to implement this provision?

Mr. MERKLE. I would be happy to, Senator.

First, in the area where those facilities are government facilities, we can use existing authorities, and we have made great progress in mapping those out.

The next piece that needs to come to fruition is we need to generate a rule around this and the associated infrastructure and policies to support it. One of the things we anticipate is there will be a great number, thousands and thousands, of potential requests for these restrictions. So we are working on the processes for how we would manage that.

And we also think that as we move toward remote identification, that it will also be helpful in making sure that as people begin to operate, we can enforce what we implement in 2209.

Senator FISCHER. Has the FAA received applications to prohibit UAS operations? And if so, have you granted those?

Mr. MERKLE. In the case of local incident commanders and in support of public safety missions, we routinely implement those. There are some cases where some companies have requested general flight restrictions that not only pertain to UAS but they pertain to manned aircraft as well, and we have implemented those as well.

Senator FISCHER. Have you taken any other steps to prevent unauthorized operations, whether it is over-critical infrastructure or near-critical infrastructure?

Mr. MERKLE. We have. As of yesterday, we announced new information for airports and how they can effectively use counter-UAS technologies to detect at airports and implement a process for rallying local public safety response and the airport and the FAA all together as a coordinated response.

Senator FISCHER. Thank you.

Mr. Merkle, agriculture is increasingly utilizing new technology in innovative ways and that includes the adoption of UAS. What are some of the unique characteristics FAA has learned about ag operations with UAS either through the part 107 process or the integration pilot program?

Mr. MERKLE. Well, I am very happy to report that since we have implemented part 107, agricultural operations have become very routine, particularly visual line of sight. We are also working through partnerships for safety and other programs, including the integration pilot program, enabling beyond visual line of sight operations for agriculture as well.

Senator FISCHER. I have heard directly from farmers and ranchers about the increased usage of UAS and how helpful it is for their businesses, for their operations. Do you hear directly from them as well?

Mr. MERKLE. We do, and they seem very pleased. They seem to be able to operate much more in conformance with what their mission needs are today. And as they identify new needs, we are working with them to identify new ways to approve their missions.
Senator FISCHER. Have you reached out to any ag groups specifically in trying to provide information to them, to educate them on rules and regulations that are out there besides providing them with that information, to also get that feedback?

Mr. MERKLE. We have. We have reached out to agriculture through a number of means. We have a series of webinars for 107 operators that help them understand how to best operate under part 107. We have also reached out either directly through their associations or through companies that work with them and helping them understand how to build their operations.

Senator FISCHER. Thank you.

Senator Cruz.

STATEMENT OF HON. TED CRUZ, U.S. SENATOR FROM TEXAS

Senator CRUZ. Thank you very much.

Welcome to each of the witnesses.

Let me start, Mr. Stallmer, with a couple questions for you. As you note in your testimony, although the number of launches has increased in the past 5 years from 12 to 32, that number pales in comparison to the roughly 15.5 million flights that transit the national airspace in a given year.

Given this dramatic disparity in frequency, as well as the maturity of the traditional aviation sector as compared to the commercial space flight sector, does it make sense in your judgment to treat commercial space flight exactly the same as traditional aviation for the purpose of national airspace integration?

Mr. STALLMER. Thank you very much for that question, Senator. I think at the time, no. I do not think they can be compared the same. And let me give you a few quick examples.

In the past week alone, out of Texas, in western Texas, Blue Origin recently launched and landed their New Shepard launch vehicle, a vehicle that was not around 6 years ago—5 years ago.

SpaceX has just recently launched a mission to the International Space Station carrying cargo to the International Space Station. A year and a half ago, SpaceX launched a Falcon heavy launch vehicle that landed two boosters successfully back to Earth. This had never been done before.

We have new entrants that are—I should not say new entrants, but new concepts, new capabilities that are entering the market at a rapid pace that are all very unique. So the maturity of our industry—although we are making rapid advances, I do not think that we should fall under the same guidelines and rules that an industry that has been a very robust industry for the past 50 or 60 years fall under those same rules.

So I think it takes a little more time. I like the regime that we have right now with the FAA's Office of Commercial Space Transportation, the licensing procedures, the permitting procedures, and how they have been working with industry and regulating industry. I think that is the ideal approach as it is a crawl, walk, run. The industry is doing outstanding, but there is a lot of unique entrants into the industry and it is only going to continue to grow. And we need that support to help it continue to grow.
Senator Cruz. Mr. Monteith, as you note, title 51 in the U.S. Code directs the Secretary of Transportation to, “encourage, facilitate, and promote commercial space launches and reentries by the private sector.” How important is that statutory mandate, and how does DOT go about complying with it?

Mr. Monteith. Thank you, Mr. Senator.

First off, I would tell you that the best way for us to enable, facilitate, and promote the industry is to ensure that we have the right regulations at the right scope at the right time. The worst thing we can do for this industry is over-regulate to the point where we are not increasing effectiveness of public safety, but we are creating hurdles to either new innovative technologies or putting undue bureaucratic overhead on our existing companies.

As far as what we call EFP specifically, the way that we in the Department carry out those responsibilities are primarily through our engagement with industry, with organizations like Mr. Stallmer’s. And that way we understand what industry is doing. We listen to their concerns, where we should focus, and quite frankly, where we can get better in our processes primarily related to the length of time it takes to license an operation without compromising safety.

Senator Cruz. Mr. Lovering, according to a report published by Deloitte in July 2018, the market for vertical takeoff and landing vehicles is burgeoning at a meteoric rate. The report estimates that the market will be worth $21 billion by 2035. The report also states that the global unmanned traffic management market is expected to grow at a compounded annual growth rate of over 20 percent from 2019 to 2025, all of which will mean more jobs and more opportunity for Americans.

Mr. Lovering, in your judgment, how will the growth in the UAS market benefit Texas and the Nation more broadly?

Mr. Lovering. Thank you, Senator Cruz.

UAM, while it is focused today on launching urban access to the skies, this is just the beginning. So in your state, in particular, we have already seen a lot of activity around Dallas and an interest there. There are, obviously, lots of other cities that will be very interesting for us to explore. And I think while in the beginning we are looking at having city integration for these services, as battery technology improves, as the battery costs come down, we are looking at being able to expand this to more and more areas. So maybe we will start off in urban areas but then eventually suburban and rural areas. So we are really seeing this as being able to access a wider range of people in the cities and also in rural areas.

Senator Cruz. Thank you.

The Chairman [presiding]. Thank you very much, Senator Cruz.

Senator Peters.

STATEMENT OF HON. GARY PETERS,
U.S. SENATOR FROM MICHIGAN

Senator Peters. Thank you, Mr. Chairman.

Thank you to our witnesses here today.

I want to follow up—my first question follow up on some of the discussion I heard with Senator Fischer related to the agricultural sector. And so my question is to you, Mr. Merkle.
I am certainly glad the FAA has established a Drone Advisory Committee to better inform agency policies. And as you are well aware, three out of four American farmers are now using UAS.

I am working on some legislation to make sure that on that advisory panel that we are hearing directly from the agricultural industry, as well as forestry and other areas. Would you support adding members to the Drone Advisory Committee from rural America, particularly agriculture and forestry?

Mr. MERKLE. In the composition of the Drone Advisory Committee, we support having a broad range of users and manufacturers, operators. So it is really up to the Congress and the Secretary how that is composed, but we do support a broad representation. We have a very rich representation from state, local, and particularly public safety right now.

Senator PETERS. Right. So I gather from your testimony you would be supportive of making sure there is adequate rural representation on that board if Congress decides?

Mr. MERKLE. We definitely support a very broad range of all the users to make sure everyone is at the table and all the voices are heard.

Senator PETERS. Great. Thank you.

General Monteith, questions for you. As we have talked about the increase of launches as we continue to put more vehicles into space, my question for you is, is there sufficient Federal support for commercial space launch facilities? So, for example, is the FAA looking at how the demand for launches is expanding and consider whether or not we have adequate facilities around the country to launch the increased traffic that we are seeing?

Mr. MONTEITH. Thank you, Senator Peters, for your question. I believe we do. Within my office, we license not only launches and reentries, we also license spaceports in the United States. We currently have 12 licensed spaceports, four that are launching rockets at this time. And recently we have stood up an Office of Spaceports so that we can better consolidate our efforts within my office to ensure that we are working with the appropriate stakeholders that currently exist and also to ensure that we have streamlined processes to evaluate and license prospective spaceport applicants.

Senator PETERS. So that is my next question. The Michigan Launch Alliance is looking at siting a launch facility for polar orbits in northern Michigan but also a launch over some restricted airspace which, from a safety perspective, would make a lot of sense to get into those polar orbits.

What support does the FAA offer to spaceport activity like we are seeing standing up in Michigan?

Mr. MONTEITH. Thank you, Senator Peters, for your question.

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Senator PETERS. So that is my next question. The Michigan Launch Alliance is looking at siting a launch facility for polar orbits in northern Michigan but also a launch over some restricted airspace which, from a safety perspective, would make a lot of sense to get into those polar orbits.

What support does the FAA offer to spaceport activity like we are seeing standing up in Michigan?

Mr. MONTEITH. So, sir, interestingly I am going up there in a couple of months to speak at an event and directly talk to the folks who are proposing this.

But within my office, we offer what we call pre-application discussions. So we work with potential spaceport applicants to help them navigate through the system and help them understand what will be required for us to effectively evaluate a license.

Senator PETERS. Very good.

Just a quick question for you, General Monteith. As we are all well aware, 50 years ago two Americans made a giant leap for
mankind and humankind when they landed on the Moon. I think if you are looking at numerous public and private missions that are now being planned to go back to the Moon, it is a very exciting time for space exploration.

But I also believe that it is probably important that we protect and preserve the honor of that Apollo 11 landing site. I know there are some NASA recommendations to preserve that site as additional missions go to the Moon. Would you support codification through legislation to protect the Apollo 11 landing site for future generations?

Mr. MONTEITH. Sir, I think it is important that we protect all of our historical sites, whether it is on the Moon or it is here on Earth. Things like the Apollo moon landing, the first only occurs once, and I think it is critical around the globe that we understand that and we preserve those types of unique locations.

Senator PETERS. Thank you. I appreciate your testimony.

The CHAIRMAN. Thank you, Senator Peters.

Senator Blackburn.

STATEMENT OF HON. MARSHA BLACKBURN, U.S. SENATOR FROM TENNESSEE

Senator Blackburn. Thank you, Mr. Chairman.

And, Mr. Brooks, I want to say a welcome to you. As a Mississippi State grad, I am delighted to learn a little bit about the Raspet Center of Excellence—or the ASSURE Center of Excellence I think it is actually and the work that you all are doing there. I will say this. You probably have plenty of open space around you that you can do this experimentation. And we thank you for the work specifically that you are doing that encourages protecting our coast and our borders and supporting our men and women in uniform who are trying to protect this nation’s borders. So we thank you for that.

Mr. Merkle, I want to talk with you a minute about the Memphis, Shelby County UAS integration pilot program. We all know that the Memphis airport, in partnership with FedEx which is collocated there at the airport, are doing some work. They have done some advanced drone operations and some beyond the visual line of sight operations over people and operations at night. And they are testing the use of drones for aircraft inspections and security and perimeter surveillance there. We also have the National Guard that is located on that same field. And I think it is really quite impressive what they are doing. You have got about 240 flights a day, 4.3 million metric tons of cargo, and they are processing about 475,000 shipments per hour there at the Memphis airport.

So we are a year into this program, and what has the FAA learned from this program and the data that has been gathered from it?

Mr. Merkle. Thank you for the question, Senator.

As you mentioned, at Memphis airport, Shelby County, we have made some tremendous strides, and I think it is a great example of how we can quantify the benefits of UAS. So the one specific example of visual inspection of aircraft—it took up to 3 hours to inspect one of those cargo jets, and now it takes less than an hour.
And it is also a benefit to human safety in that people do not have to crawl around on the aircraft, and now the drone can do that.

So at Memphis and our other IPP sites, we are really starting to see the data roll in in three areas: one, enabling more and more complex operations. So the initial operations that we have are starting to bring in data for more and more complex operations. And in conjunction with the research that is done at ASSURE, we had a very important approval of a national-wide waiver for an insurance company to be able to do inspection of post-disaster and go in, as a result of some of the work they did after Hurricane Florence. That is another example. And so beyond visual line of sight work, detect and avoid work, all of these things—technologically how do we better integrate into the airspace system.

And now that we have flights, we are also starting to see community-wise, what does this mean to a community. So now we can interact with a local community and collect data on how do you——

Senator Blackburn. Yes. Let me ask you this. What do you see as the next step applications for the technology and for the data? You just mentioned moving to communities. So where do you think this is going to take you?

Mr. Merkle. So let us start with communities. Engaging a community early and actively engaging them is a very good way to ensure that the operations get up and running and are supported by the community. Community engagement is vital. So that is also informing how we do airspace access for those aircraft as well. And it alleviates the community’s concerns about airspace access.

I think the next place we are going technologically for integration into the NAS, which is our main goal, is beyond visual line of sight and more and more complex operations for beyond visual line of sight, kind of working off those gates that have been holding us to this longer mission.

Senator Blackburn. I have one other question that I will submit for the record for you to answer, but it deals with adequate spectrum for the national airspace system. I think that for many of us who do policy work in this area, assuring that we are going to have the available spectrum to meet the needs is something that is important.

I yield back.

The Chairman. Thank you, Senator Blackburn.

Mr. Merkle, how is the FAA’s current UAS rulemaking effort going, and are you able to give us a date on when you will release remote ID?

Mr. Merkle. Thank you for the question.

Our current plan for remote ID is to release it in July. It is July. And we are working currently to ensure that we keep the policy component, along with the standards component and the remote ID infrastructure component, all developed and harmonized.

The Chairman. Very good. That is helpful information.

Let me ask you, Mr. Merkle, do you have access to other testimony? I do not know. Do we make written testimony available?

Mr. Merkle. No, Senator, I did not——

The Chairman. OK. You know what?

Mr. Stallmer, on about the fourth page of his testimony, lists a number of things the FAA should do—13 recommendations. So you
have not read them, and I guess it would take too long to read them all.

How are you working with people like that on suggestions that they are making like establishing a space operations committee, establishing a steering committee to provide ongoing input to the FAA and NAS, and invest in developing tools and capabilities that will enable a future NAS state where air traffic management shifts from segregation to integration? What do you think about those?

Mr. MERKLE. I would actually ask my colleague to answer that question.

The CHAIRMAN. OK. Mr. Monteith, you are a better person to ask certainly.

Mr. MONTEITH. Senator Wicker, I have reviewed Mr. Stallmer’s suggestions, and I would say that we currently work with industry and will continue to work with industry to be good regulatory partners with them. Some of the items that he brings up we are already working on, and the others we will continue to address.

The CHAIRMAN. OK. You know, I think what I will ask you to go on the record for those 13 suggestions. If you would just go ahead and respond on the record within a week or so, that would be helpful.

Mr. Lovering, by the time I get through working at night, usually the expressway is cleared. But on those occasions when I have got to get my little Honda on the expressway and head to the 14th Street Bridge along about 6 or 6:30, it is pretty crowded.

I would really like to get on some sort of hovercraft somewhere around the Russell Building and land on some sort of pad, say, near Old Town. When am I going to be able to do that? When are American citizens in urban areas going to be able to do that? And is it going to be completely safe? Will it be affordable to regular working Americans?

Mr. LOVERING. Thank you, Chairman Wicker.

Personally I would love nothing more than for you to take that trip with us as well.

Roughly in terms of timeline for when this is all going to roll out, we are looking at mid to late 2020s practically. Frankly, though, especially leaning in our 50-year history of developing safe and certified and secure aircraft, we are going to take the time we need to ensure these vehicles are safe before they are flying people.

The CHAIRMAN. Well, that is a good idea. I like “mids” better.

So is it going to be affordable? How in the world will the average working American be able to afford such a thing?

Mr. LOVERING. I have two perspectives on that. So first, I think one example—it is not exactly these electric airplanes quite yet, but we do have our Voom helicopter operations currently operating in two cities outside the U.S. We are launching here in the U.S. this year. But it is an app on your phone and it connects you to a helicopter. And the price that you pay for that kind of trip is roughly the equivalent of a Lyft premium ride service. It will be a little bit more than expensive, almost like an expensive taxi effectively.

But we are expecting all these costs to come down quite rapidly. One of the reasons that we find that these type of operations are expensive today is because we do not get that many flight hours
per year out of these aircraft, but as operations scale up, the flight
hours that are being flown by these vehicles increase dramatically
which lowers a lot of the prices. There are a lot of fixed prices in
there that you have to amortize.

The CHAIRMAN. So where can I do that now?

Mr. LOVERING. Today you can do it in São Paulo, Brazil; Mexico
City, Mexico; and then we are going to be launching in San Fran-
cisco this year.

The CHAIRMAN. Maybe we need to have a field hearing.

[Laughter.]

The CHAIRMAN. Gentlemen, thank you very much for being here.
As I said before, we were thrown into a little confusion because of
the scheduling of a series of five votes. But I want to say how much
I appreciate each of you coming.

We are going to close the hearing now, and let me note that the
hearing record will remain open for two weeks. During this time,
Senators are asked to submit any questions for the record. Upon
receipt, the witnesses are requested to submit their written an-
swers to the Committee as soon as possible, perhaps by tomorrow
afternoon. No as soon as possible.

We very much appreciate you coming. Thank you for adjusting
to our schedule.

And unless my staff tells me otherwise, we are adjourned.
[Whereupon, at 10:44 a.m., the hearing was adjourned.]
APPENDIX

ELECTRONIC PRIVACY INFORMATION CENTER
Washington, DC, May 6, 2019

Hon. ROGER WICKER, Chairman,
Hon. MARIA CANTWELL, Ranking Member,
U.S. Senate Committee on Commerce, Science, and Transportation,
Washington, DC.

Dear Chairman Wicker and Ranking Member Cantwell:

In advance of the upcoming hearing on “New Entrants in the National Airspace: Policy, Technology, and Security Issues for Congress”1 we write to inform you of EPIC’s ongoing work to establish privacy safeguards and identification requirements for the deployment of drones in the National Airspace (NAS). The Federal Aviation Administration (FAA) must: 1) issue regulations on drone privacy, and 2) mandate the remote identification of drones. Further delay jeopardizes the security, safety, and privacy of Americans.

EPIC is a public-interest research center established in 1994 to focus public attention on emerging privacy and civil liberties issues. EPIC has taken a particular interest in the unique privacy problems of Unmanned Aerial Vehicles (UAVs or “drones”), has petitioned the FAA to establish limits on surveillance by drones, and has sued the FAA for its failure to establish privacy safeguards to protect Americans.2 EPIC sued the FAA for the agency’s failure to establish drone privacy safeguards.3 EPIC has also filed suit to enforce the transparency obligations of the Drone Advisory Committee, a body created by the FAA to study and make recommendations on U.S. drone policy.4 That FAA committee has routinely ignored its own survey data that makes clear that Americans are concerned about the surveillance risks associated with drones.5

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.6

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 survey found that a majority of Americans object to drones flying near private homes.7 However, in re-

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2EPIC v. FAA, No. 15–1075 (D.C. Cir. May 10, 2016); 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/.
7Paul Hitlin, 8 percent of Americans say they own a drone, while more than half have seen one in operation, Pew Research Center (Dec. 19, 2017), https://www.pewresearch.org/fact-tank/Continued
From 2017 to 2018, individual drone use has soared, and the FAA predicts that 7 million drones will be sold by 2020. 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. 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 four miles away and can live-stream that video. 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 meters away. Drones can be used to view individuals inside their homes and can facilitate the harassment and stalking of unsuspecting victims. 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.

Drones also pose risks to security and cybersecurity. Close calls between drones and traditional aircraft have risen significantly as their use becomes more widespread. Furthermore, the very features that make drones easy to operate also make them susceptible to cyberattacks. Hackers have the ability to exploit weaknesses in drone software to take over operation of a drone and access the camera and microphones.

The United States Department of Defense is well aware of the risks of commercial drones. According to an internal memo, dated May 23, 2018, from the Secretary of Defense regarding Unmanned Aerial Vehicle (UAS) Cybersecurity Vulnerabilities, the “DoD Inspector General found that DoD has not implemented an adequate process to access cybersecurity risks associated with using commercial-off-the-shelf (COTS) Unmanned Aerial Systems (UAS).” As a consequence, the Secretary instructed:

- “Effectively immediately, you must suspend purchases of COTS UAS for operational use until the DoD develops a strategy to adequately assess and mitigate the risks associated with their use.
- “(U/FOUO) In addition you must suspend the use of COTS UAS until the DoD identifies and fields a solution to mitigate known cybersecurity risks.”

The DoD decision follows a letter to the Secretary from Senator Chris Murphy outlining concerns about drones manufactured by DJI, the largest distributor of commercial drones in the United States. According to Senator Murphy, at least

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18 Senator Chris Murphy, Following Security Threats, Murphy Calls on Sec. Mattis to Ban Department Use of Foreign-Made Commercial Drones: These vulnerabilities pose a tremendous national security risk... and without a trusted domestic source of unmanned aerial sys-
three separate agencies have found that the commercial unmanned aerial systems (UAS) from the Chinese drone manufacturer pose a potential national security threat.

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 press the FAA to issue regulations on drone privacy, particularly following a ban by the Department of Defense on the purchase and use of commercial-off-the-shelf drones.

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.”

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.

Indeed it has been over 60 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.

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.

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.” 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.” Nearly 63 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.

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.
Remote Identification of Drones

The Federal Aviation Administration recently published an interim final rule that will require a visible registration number on the exterior of drones. Previously, registration numbers could be hidden inside drones. While EPIC agrees external marking are preferable to hidden identifiers, EPIC said the rule did not go far enough. In comments to the FAA, EPIC wrote, “Because drones present substantial privacy and safety risks, EPIC recommends that the FAA require any drone operating in the national airspace system to broadcast location when aloft (latitude, longitude, and altitude), course, speed over ground, as well as owner identifying information.” EPIC also suggested the agency require operators register and broadcast surveillance capabilities.

As Senators Thune and Markey wrote to the FAA last week “remote identification will enhance safety, security, and privacy.” The Senators noted that the FAA was to issue regulations or guidance on remote identification by July 2018, but, nearly a year after that deadline, no such regulations or guidance has been issued by the FAA.

Currently, individuals cannot hold drone operators accountable because it is essentially impossible to identify the drone or the operator of a drone. The modified registration scheme proposed by the FAA still does little to solve this problem. Solutions exist. To increase accountability of drone operators, the FAA Reauthorization Act of 2018 requires the FAA to consider and develop remote identification for drones. As the FAA Aviation Rulemaking Committee Working Group 1 pointed out, “placing a sticker or FAA registration number on the UAS will not provide remote ID and tracking, as it would be nearly impossible to read a registration number on a UAS that is more than a few feet away.” Passive identification does not go far enough—the FAA must require active remote identification. The FAA should mandate remote identification and ensure also that drones routinely broadcast course, location, and other relevant operational information. Drones should simply not continue to fly above the laws that protect public safety.

The Committee should urge the FAA to complete a rulemaking on remote ID and to include privacy considerations in that rulemaking.

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,

Marc Rotenberg
EPIC President

Caitriona Fitzgerald
EPIC Policy Director

Jeramie Scott
EPIC Senior Counsel


RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JERRY Moran TO Jay Merkle

Question 1. The ability to fly drones beyond visual line of sight is the key to unlocking the true potential of the drone revolution. The possibilities that this new technology presents seems endless, but are currently limited by the inability to utilize their full potential. Current waivers in the UAS Integration Pilot Program enabling beyond visual line of sight activity rely heavily on ground-based radars. However, the idea that ground-based radars are the only means of supporting beyond visual line of sight drone flights is simply not scalable.

Director Merkle, what means of detection and surveillance other than ground-based radars are predicted to support beyond visual line of sight drone flights?

Answer. Operators who want to fly beyond line-of-sight UAS operations must know where their aircraft is, and be able to dynamically react to and potentially avoid other air traffic in the process. There are various technologies under development to support these critical safety and security requirements. We evaluate all potential technology solutions for their ability to mitigate the risks associated with BVLOS operations based on technology agnostic performance standards. The FAA is focused on supporting the development of UAS Traffic Management (UTM) capabilities, such as remote identification, to facilitate the use of such technologies.

Question 2. Is the FAA researching these alternative technologies or do you see technological solutions emerging from industry that offer a near-term solution?

Answer. The FAA is one of several NASA partners, along with industry representatives, working to develop technologies and requirements for a UTM ecosystem. The FAA is particularly focused on remote identification requirements, and in December 2018, we released a request for information (RFI) for remote ID data sharing solutions. The FAA firmly believes that technological solutions will emerge from industry in the near term that can meet the safety standards needed to ensure safe beyond visual line-of-sight UAS operations.

Question 3. How do you envision UTM enabling beyond visual line of sight operations in the Integration Pilot Program and beyond as a solution to replace or augment the current need for visual observers and an extensive network of expensive ground-based radars?

Answer. This summer, NASA is conducting a series of UTM test demonstrations, as part of its ongoing work with the FAA to explore potential UTM solutions. The FAA is also conducting ongoing UTM research and testing through three of its UAS test sites. That work is helping to inform and enable some IPP activities, but may not be ready to provide an advanced UTM solution for the IPP participants before the end of the program in October 2020. However, a number of IPP participants are currently exploring a variety of related technology and procedural solutions that may enable more complex beyond visual line-of-sight operations before the end of the program.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARSHA BLACKBURN TO Jay Merkle

Question 1. In the UAS Traffic Management (UTM) system, drones will be transferring data between vehicles, between vehicles and the UTM, and with end users of the technology. Given the complicated nature of this ecosystem, we need to ensure that there's enough flexibility to handle the sheer quantity of unmanned vehicles, especially when considering how to bring in data from fixed points in the area to help maximize their efficiency and efficacy.

Mr. Merkle, what are the FAA’s plans for ensuring that adequate spectrum is available for the emerging technologies in the National Airspace System?

Answer. For UAS operating in a UTM environment, the FAA has left the choice of method of communication between drone and operator to the manufacturer and the operator, respectively. This approach aligns with the rapid introduction of small UAS and the desire of the larger community to not hinder use and innovation by treating these new entrants as traditional aircraft with specified communication requirements. This is also in keeping with the operational paradigm that ATC will not directly interact with UAS or the operator. Communications in all but the rarest circumstances will be by automatic information exchanges over a ground-based Internet communications. Hence, there are no spectrum requirements for the FAA’s interaction with operators.

Question 2. Are there specific bands that you have in mind that these technologies will operate on?

Answer. There is no consideration of using aviation-protected spectrum for UTM.
Question 3. Has the FAA considered testing spectrum-sharing models to aid in making decisions on utilizing licensed and/or unlicensed spectrum?

Answer. This is not a consideration given the communication policy for small UAS.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MIKE LEE TO JAY MERKLE

Question 1. We are approaching the one-year anniversary of the FAA’s formal rollout of the UAS Integration Pilot Program (IPP). One of the stated objectives of the IPP was to “test and evaluate various models of State, local, and tribal government involvement in the development and enforcement of Federal regulations for UAS operations.” This includes the testing of “reasonable time, place, and manner limitations on low-altitude UAS operations.” In light of the IPP’s near one-year anniversary, can you tell me specifically how the FAA has tested reasonable time, place, and manner limitations?

Answer. To date, none of the IPP Lead Participants have proposed or requested time, place and manner restrictions.

Fundamentally, it is the FAA’s responsibility to manage the airspace. All stakeholders, including states and localities, should have a voice, and the FAA has always accommodated the needs of local communities to the maximum extent possible, while balancing aviation safety, national security, air commerce, and citizens’ rights to airspace access.

A good example of that is our existing special provisions for local emergency responders to contact the FAA and request to close off UAS operations in a particular area because of an accident, hazard, or police action. We would generally take that action in order to create a safe operational response environment for law enforcement to conduct its vital public safety mission.

In other situations, such as the aftermath of a hurricane, we facilitate and enable many local drone operations to survey infrastructure damage and conduct other types of damage assessment. We see those types of interactions continuing and the IPP program is already helping us learn how those interactions should continue in the future.

Question 2. What outreach have you conducted to gain the input of State, local, and tribal governments?

Answer. The IPP is an ongoing partnership with the state, local and tribal governments who are known as the Lead Participants in the program. The IPP program managers and other FAA officials have daily or weekly contact with their Lead Participants counterparts. In addition, there are workshops and periodic Focus Meetings where all of the Lead Participants come together to discuss their progress, as well as common challenges and solutions. The FAA has asked the nine Lead Participants several times specifically whether they had any interest in time, place and manner restrictions, and to date, none have chosen to pursue those options.

Question 3. What are your specific plans for future time, place, and manner limitations before the IPP expires?

Answer. We expect to continue our ongoing dialogue with the Lead Participants about those options, but to date, they have indicated they have been able to pursue their missions without them.

Question 4. How are you encouraging the testing of time, place, and manner limitations?

Answer. As mentioned, we are continuing our dialogue with the Lead Participants about situations in which those types of restrictions might be helpful or appropriate.

Question 5. Low-altitude drone operations are now a major focus for States who are rightly concerned about issues related to property rights, land use, zoning, trespass, privacy, and local police matters. Each of these issues are traditionally within the jurisdiction of a State by nature of their inherent police powers. Can you identify the limits to the FAA’s authority in relationship to a State’s police power?

Answer. States and local jurisdictions have legitimate concerns about UAS operations, involving such areas as security, privacy, trespass, and enforcement. 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.

While the case law is clear that state and local governments may not regulate aircraft safety or the efficiency of the airspace, including flight operations, they may regulate aviation outside of these areas. Goodspeed Airport, LLC v. East Haddam
Inland Wetlands and Watercourses Commission, 634 F.3d 206 (2d Cir. 2011); Skysign International, Inc. v. City and County of Honolulu, 276 F.3d 1109 (9th Cir. 2002). Under the current Federal statutory and regulatory framework, there is room for state and local governments to have some impact on UAS operations. For example, they have authority to regulate the placement of aircraft (including UAS) landing areas, which Federal courts have acknowledged as a legitimate land use and zoning power. In addition, state or local governments would be able to regulate certain uses of UAS through the application of existing voyeurism or other privacy laws for example, or to prevent use of UAS to photograph outdoor crime scenes where ground-based photographers were required to remain behind police lines. Also, if an operator of a UAS was endangering the lives of persons on the ground, then the local government would be able to apply existing reckless endangerment or similar laws against the operator.

In the Goodspeed case, Connecticut statutes and municipal regulations required a local airport to obtain a permit before removing trees on protected land that were in the flight path. The airport argued that the permits were not preempted by Federal aviation law, because those generally-applicable laws did not come within the scope of the preempted field—aviation safety—in either their purpose or in their effect. The lower court pointed out that “courts have long distinguished between state laws that directly affect aeronautical safety, and the incidentally imposed safety standards, on the one hand, and facially neutral laws of general application that have merely an incidental impact on aviation safety.” Goodspeed, 681 F.Supp.2d 182, 201–202 (D. Conn. 2010). The Second Circuit upheld the lower court, finding that “[a]lthough we hold that Congress intended to occupy the entire field of aeronautics safety, the generally applicable state laws and regulations imposing permit requirements on land use challenged here do not, on the facts before us, invade that preempted field.” Goodspeed, 634 F.3d 206, 211 (2d Cir. 2011). The decision was consistent with an amicus brief filed by the United States at the court’s request. Similarly, in Skysign, a question was raised regarding Federal preemption of state and local regulation of aerial advertising in light of the Federal Government’s responsibility for air traffic governance. The court held that Federal aviation regulations relating to air traffic, the flight of aircraft, safe altitudes, and for protection of individuals and property on the ground did not “preclude local regulation [signage ordinance] with an identical purpose that does not actually reach into the forbidden, exclusively Federal areas, such as flight paths, hours, or altitudes.” Id. at 1117. The United States filed an amicus brief at the request of the court and supported a finding of no preemption.

**Question 6.** Is there a point in the air as you approach the ground where the domain is more traditionally viewed as under the State’s jurisdiction? In the FAA’s view is this authority only feet above the ground? Inches above the ground? Answer. State authority to regulate aircraft safety and the efficiency of the airspace does not depend on altitude; while states may regulate pursuant to their police powers, the case law is clear that they cannot regulate aircraft safety and efficiency of the airspace at any altitude. Goodspeed Airport, LLC v. East Haddam Inland Wetlands and Watershed Commission, 634 F.3d 206 (2d Cir. 2011); Skysign International, Inc. v. City and County of Honolulu, 276 F.3d 1109 (9th Cir. 2002); Air Transport Association of America v. Cuomo, 520 F.3d 218, 224 (2d Cir. 2008); National Helicopter Corp. v. City of New York, 137 F.3d 81, 92 (2d Cir. 1998).

**Question 7.** There have been a number of concerning reports where drones are seen flying in airspace where they are not authorized to be—over sports stadiums, smuggling contraband into prisons, and near airports. Do you think full and safe drone integration is possible without the ability of State/local police to take real-time action to safeguard the public? Answer. Local authorities have a range of recourse in response to persons operating UAS in an unsafe manner in their jurisdictions. Localities can prohibit take-offs and landings of aircraft in their jurisdictions; hence, it is possible to prohibit such activities in and around public gatherings. The FAA also has published a media toolkit to assist local jurisdictions in their duties to protect public safety and the FAA also works with localities to facilitate a better understanding of the division of authorities between them and the FAA. The FAA strongly recommends proactive local public communication, education, and outreach. We have a wide-range of resources available on the FAA.gov/UAS website to support both the use of drones and response to unauthorized drone activity by law enforcement. The FAA also utilizes the relationships that our Law Enforcement Assistance Program (LEAP) Agents have developed with Federal, State and Local law enforcement agencies to inform and assist in the awareness of UAS security related best practices and counter-UAS (C–UAS) implementation initiatives. We continue to work
closely with the law enforcement community to investigate and enforce the unlawful operation of UAS.

Due to the spectrum-related impacts of many C–UAS systems, some current C–UAS technologies pose a potential risk to safety-of-life systems, specifically Air Navigation Service critical infrastructure and on-board avionics. In particular, C–UAS technologies can impact air-ground communications, Global Positioning System (GPS) dependent navigation, and other surveillance systems. The operational use of C–UAS in the National Airspace System also poses an indirect risk to persons and property on the ground or other aircraft in flight depending on how the drone responds to the C–UAS technology—such as reacting unpredictably when control links are disrupted. Lastly, some C–UAS systems can interfere with authorized or compliant drone activity that may be occurring in proximity to the unauthorized drone.

Many C–UAS technologies were designed for military use abroad—a context in which collateral impacts are not a significant concern. It is vital that C–UAS systems be tested in civil environments to determine both the impacts on the NAS and other critical systems as well as efficacy—especially before approximately 18,000 independent law enforcement agencies across the country have the authority to deploy C–UAS.

We believe the most appropriate path, at this time, is to focus on implementation of the UAS mitigation authority granted to DOD, DOE, DOJ and DHS, and analyze the results of UAS detection and mitigation testing that FAA and our national security partners are planning and conducting. The development of standards for the use of C–UAS technology is also critical.

Under § 1602 of the 2018 FAA Reauthorization Act, Congress authorized mission-specific testing and use of C–UAS systems by DOJ, specifically for the protection of penal, detention and correctional facilities and operations conducted by the Federal Bureau of Prisons. The FAA is working closely with DOJ in executing this mission.

Under § 1602 of the 2018 FAA Reauthorization Act, DHS and DOJ are authorized to provide support to State, local, territorial, or tribal law enforcement; upon request of the chief executive officer of the State or territory; to ensure protection of people and property at mass gatherings. The supported event must be limited to a specified time-frame and location, within available Federal resources, and without delegating any authority under this section to State, local, territorial, or tribal law enforcement.

As we conduct U.S. civil testing and implement the C–UAS authorities granted to DOD, DOE, DOJ and DHS, we are gaining experience, refining concepts of operations, and hopefully will see improved C–UAS systems with less potential for airspace safety impacts. This work is necessary prior to considering expanded C–UAS authorities in the future.

The FAA has existing authorities and tools to restrict operations over certain kinds of events and locations right now. Events of national significance often designated as National Special Security Events (NSSEs) or Special Event Assessment Rating events include events such as the Super Bowl; and the FAA has a standing so-called stadium temporary flight restriction that restricts flight over stadiums during major league baseball, NFL, NCAA, and motor speedway events.

With respect to smaller events, we envision the future suite of Unmanned Traffic Management (UTM) services, which will include remote identification and dynamic airspace management, may allow for real time restrictions over smaller gatherings and enable security partners to provide direct operator notification as well as locate an operator of a suspected unauthorized UAS operation.

Question 8. How does the FAA believe local police or other non-federal police should respond to any drone related incidents that arise in low-altitude airspace?

Answer. As with all ground-based threats, State and local law enforcement are often the first to respond to a potential safety or security risk—like a UAS flying over a filled parking lot before a football game. We recognize that local law enforcement is critical to any UAS response plan. The FAA has a wide-range of resources available on the FAA.gov/UAS website to support response to unauthorized drone activity by law enforcement, including pocket cards, videos, and webinars. The previous response (#7) provides detail on how local law enforcement and the FAA can, and in many instances already do, work together to respond to UAS-related incidents. There are some types of detection systems that are legal for state and local governments—and even the private sector—to use now in order to identify unauthorized UAS and, in some cases, the location of the operator. However, we strongly recommend two actions to any organization considering use of a UAS detection system:
1. Consult legal counsel that is familiar with Federal surveillance and communications laws to ensure the selected detection system is, in fact, legal to use; and

2. Validate vendor-published system performance specifications. Many systems are tested in highly controlled environments and not in RF-rich operational environments. Accuracy of detection information, which is highly-susceptible to interference or distortion, is critical to operational response. In early May 2019, the FAA published an information package for airport sponsors containing useful information about UAS detection systems and how to coordinate with the FAA. Much of that information is useful to entities considering how to identify and respond to unauthorized UAS operations outside the airport environment as well.

Question 9. On May 7, 2019, the FAA released a statement on UAS detection systems at airports. The FAA statement noted that “The FAA does not support the use of counter-UAS systems by any entities other than Federal departments with explicit statutory authority to use this technology, including requirements for extensive coordination with the FAA to ensure safety risks are mitigated.” In light of recent events at Gatwick, airport authorities are rightly concerned about safety and security threats posed by malicious or reckless drones used on or near airports. If the FAA does not support the use of detection systems or counter-UAS systems used by anyone other than an authorized Federal department, what recourse does an airport sponsor have right now to address these safety and security concerns at an airport?

Answer. Only four Federal departments (the Departments of Defense, Justice, Homeland Security, and Energy) can legally use counter-UAS mitigation systems—defined as those that disrupt, damage, destroy or take control of a UAS posing a threat. The statutes granting such authority limit use of C-UAS systems to protect specific types of facilities, missions, operations, and assets under specified conditions, depending on the authorizing statutory language. The FAA was given relief from certain specific statutes, but only for testing impacts and performance of UAS detection and mitigation systems at airports—not for operational use. All other federal, state, local, and private sector entities are subject to applicable Federal laws with respect to the acquisition, testing, or use of C-UAS mitigation systems, including, but not necessarily limited to various criminal provisions of title 18 U.S.C., as well as relevant state and local laws.

In terms of detection systems, there are some technologies that can be used by federal, state, local, and private sector entities to detect and track UAS—although not all forms of detection technology are clearly legal for use without statutory authority. However, planning and coordinating the use of UAS detection technology necessitates close collaboration to ensure security needs are balanced with airspace safety and efficiency.

On May 7, FAA published information to support airport sponsors decision-making related to testing and/or deployment of UAS detection systems at their airports. It is available on the FAA website at https://www.faa.gov/airports/airport_safety/#SafetyGuidance. The FAA is working with airport operators who are considering installing UAS detection systems or have already installed such systems on or near their airports—including assessing possible interference or obstruction impacts. We are assisting with development of risk-based operational response plans to make sure a safety hazard is not created by trying to address a perceived UAS risk. FAA expects to provide supplemental information related to UAS detection system coordination as we refine our processes and procedures for safe UAS detection system use and coordinated operational response at or around airports. The FAA is currently compiling a supplemental checklist of planning factors to consider and key contacts at its national headquarters, with which airport authorities can work in support of our common goal of safety in the National Airspace System.

In that May 7 correspondence, the FAA also provided information regarding the steady state use of counter-UAS (mitigation) technologies at or around airports. These systems could pose an aviation safety risk by interfering with aircraft navigation and air navigation services infrastructure. The FAA does not support the use of counter-UAS mitigation systems by any entities other than Federal departments that have complied with strict statutory requirements, including extensive coordination with the FAA to ensure safety risks are mitigated.

We are also working with our Federal partners, major airports, and industry stakeholders to develop a pre-planned Federal response to supports a persistent

1 https://www.faa.gov/news/updates/?newsId=93726
Question 10. Last month, the FAA granted Google’s Wing the first FAA air carrier certification for drone deliveries.

Is the process that the FAA used to approve Wing for air carrier operations, the process that FAA intends to proceed with for future drone delivery services?

Answer. Yes. Each applicant presents a different concept of operations and safety case, but we are using lessons learned from Wing’s part 135 certification process to inform future part 135 approvals for drone delivery. Wing chose to pursue its own part 135 certificate, but several other companies participating in the IPP have chosen to partner with an existing part 135 certificate holder or enter into partnerships with existing certificate holders that have the expertise to obtain a part 135 certificate.

Question 11. Has the FAA studied how this certification process could act as a barrier to entry for smaller market participants?

Answer. We have not conducted any specific studies, but we are well aware that the part 135 certification process may appear daunting to smaller companies. We believe the lessons learned from the Wing certification and a number of other ongoing UAS part 135 certification projects will help us streamline the process for drones and significantly reduce the burden for smaller companies.

Question 12. What is the FAA doing to reduce regulatory barriers in this process in order to facilitate competitive markets in this industry?

Answer. As mentioned in the previous answer, we believe we can significantly streamline the process to reduce the regulatory burden, as we gain more experience with issuing part 135 certificates for drone deliveries. With regard to enabling specific types of drone operations, we are also encouraging data-sharing and the development of standards for risk mitigation such as the one for drone parachutes that may greatly reduce the need for companies to conduct their own testing.

The FAA is generally focused on developing performance-based rules and policy that do not prescribe specific technologies or mitigation techniques to reduce risk. This means an applicant can propose a wide range of mitigations in furtherance of its safety case. The FAA is currently developing a UAS-specific Safety Risk Management (SRM) Order, which provides guidance to FAA employees reviewing UAS operational applications about how to evaluate an applicant’s safety case. This Order, which will be made public, will also help applicants of all economic means better understand what information to provide to the FAA in order to demonstrate how their UAS operations can be conducted safely in the national Airspace System.

Question 13. Did the FAA consult with any affected communities, local government agencies, or individual property owners prior to issuing Wing’s air carrier certificate? If yes, what are the specifics on how the consultation process is conducted?

Answer. The FAA does not generally conduct community outreach as part of the certification process, but is working very closely with Wing and Virginia Tech on an extensive community outreach plan before Wing begins any actual operations. Because this certification was conducted through the UAS IPP, the Virginia Innovation and Entrepreneurship Investment Authority was intimately involved in the effort as well.

Question 14. Is there any specific feedback from the local community or government that the FAA used to alter the authorization for delivery operations?

Answer. We will closely monitor the feedback Wing receives from its upcoming community outreach in August to determine whether there is a need to mitigate any risks of any aspects of Wing’s operations. The FAA will be especially mindful of whether community concerns exist with regard to Wing’s operations.

Question 15. Is there a process in place for promptly responding to community complaints generated by drone delivery operations? Does the FAA have a process in place for a homeowner to make requests that a drone not fly over their private property? Would you honor such a request if made?

Answer. Wing is planning to set up a website specifically to engage the community on its delivery operations and provide channels for the community to make comments or complaints. Based on its previous experience in Australia, Wing has indicated that it is prepared to try to address any community concerns. In addition, the FAA operates a support center that will be prepared to answer questions, field complaints, and channel questions or callers to the appropriate people, if community members choose to contact the FAA instead.
RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO JAY MERKLE

The Northland Community and Technical College in Thief River Falls, Minnesota, offers the first unmanned aerial systems (UAS) maintenance training program in the country, which is helping to prepare students for in-demand jobs.

Question. Do you anticipate a need for new employees trained in UAS technology to avoid a skills gap in the aviation industry?

Answer. The development of any new technology typically triggers the need for skilled workers. Congress recognized this in the Federal Aviation Administration’s (FAA) 2018 Reauthorization Act, calling for actions to support the education of UAS professionals through Sections 631 and 632 in the Act. The FAA is actively engaged with UAS industry and approximately 50 community college stakeholders from across the country and is working to develop a plan to address requirements contained in Sections 631 and 632. This plan, which leverages existing UAS-related training and certification programs to develop curricula for community college and four-year academic institutions, is anticipated to be in place by the end of CY 2019.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BRIAN SCHATZ TO JAY MERKLE

Question 1. What data does the FAA have on the expected community-wide noise levels of commercial drones?

Answer. Currently, the Federal Aviation Administration (FAA) has limited data on UAS noise levels that does not sufficiently inform an understanding of the expected community-wide noise levels of commercial drones. However, as part of the UAS Integration Pilot Program (IPP), the FAA is working to obtain additional UAS noise level data.

Question 2. Do actions need to be taken to understand how noise will increase due to drones?

Answer. Utilizing any noise-related data obtained through the UAS IPP and applying data from the FAA’s forecast of drone operations will provide a general understanding of how drone-related noise issues may be perceived by the general public. The FAA is considering conducting additional research on UAS noise in the coming years.

Question 3. Are there any efforts at the FAA to understand the health effects of drone noise? Will this be included as part of the safety standards development?

Answer. While there are no efforts specifically aimed at understanding the health effects of drone noise, pursuant to section 189 of the FAA Reauthorization Act of 2018, FAA will be conducting a study on the health impacts of noise from aircraft flights on residents exposed to a range of noise levels. FAA anticipates this study will inform our understanding of the potential health impacts of all aviation noise, including drone noise.

Question 4. When we get to the point at which commercial drone traffic is common, how will different operators be prioritized in the air space?

Answer. This is a critical question for UAS integration, and we are actively working on this issue on several fronts. The National Aeronautics and Space Administration’s UAS Traffic Management (UTM) research initiative is focused on a variety of issues regarding all manners of drone traffic, including the interaction between manned and unmanned traffic. This is not, however, a problem we are going to solve by ourselves—it requires input from all national airspace system (NAS) stakeholders, including the manned aviation industry, to determine how the current Air Traffic Management (ATM) system will interact with UTM. The foundation of any UTM solution will be remote identification, which will enable other technologies that will be part of the UTM system. The FAA recognizes the importance of remote identification and is working on a proposed rule that is scheduled to be published in September 2019.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. TAMMY BALDWIN TO JAY MERKLE

The FAA Reauthorization Act of 2018 included an initiative to support workforce needs related to the rapidly growing use of unmanned aircraft systems in industry and government. Section 631, which I worked to include in the bill, directs the establishment of a process to designate consortia of public, 2-year institutions of higher education as Community and Technical College Centers of Excellence in Small
Unmanned Aircraft System Technology. This process was to be established not later than 180 days after the enactment, a deadline which has now passed.

Question. Please provide me with the status of implementation of Sec. 631, Community and Technical College Center of Excellence in Small Unmanned Aircraft System Technology and Training.

Answer. The development of any new technology typically triggers the need for skilled workers. Congress recognized this in the FAA Reauthorization Act of 2018, calling for actions to support the education of UAS professionals through Sections 631 and 632 in the Act. The FAA is actively engaged with UAS industry and approximately 50 community college stakeholders from across the country and is working to develop a plan to address requirements contained in Sections 631 and 632. This plan, which leverages existing UAS-related training and certification programs to develop curricula for community college and four-year academic institutions, is anticipated to be in place by the end of CY 2019.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JON TESTER TO JAY MERKLE

Agricultural Sector Represented on Drone Advisory Committee. The agriculture sector is one of the fastest growing adopters of drone technology in the United States.

Question 1. Will DOT/FAA commit to ensure the Drone Advisory Committee membership reflects the diverse and broad interests of stakeholders and user communities by including a representative from the agriculture community?

Answer. The FAA is committed to maintaining a broad and diverse representation of the Drone Advisory Committee (DAC) stakeholders. The DAC membership and membership balance plan are approved by the Secretary of Transportation. The Secretary recently made new selections for DAC membership and they held their first meeting on June 7.

DAC members continue to include representatives from states, including IPP lead participant, the Kansas Department of Transportation (KDOT). KDOT’s Director of Aviation and UAS, Bob Brock serves on the DAC. UAS manufacturer and operator PrecisionHawk is involved in the agricultural sector. The company’s CEO, Michael Chasen, was named the new chairman of the DAC by the Secretary.

During the next review of candidates to fill DAC vacancies, consideration will be given to including a DAC member from the agriculture community.

Agricultural community representatives are welcome to attend DAC meetings as they are open to the public, except as provided by section 10(d) of the Federal Advisory Committee Act (FACA).

Partnering with Industry on UAS Infrastructure Buildout. With regard to UAS infrastructure buildout, Mr. Merkle stated “we have a request for information to build a cadre of industry to come in and partner with us to build it.”

Question 2. Please expand upon this statement and provide information about FAA’s process for determining which industry representatives/firms will be/are involved and their role.

Answer. In December 2018, the FAA issued a Request for Information (RFI) to establish an industry cohort to explore potential technological solutions for remote identification of unmanned aircraft (Remote ID). The RFI reflected that the FAA would establish the technical framework and criteria for Remote ID Unmanned Aircraft System Service Suppliers (USS) and provide supporting data to airspace users as necessary for collaboration and safe operations. The FAA plans to work with industry to build as much of the remote identification infrastructure as we can in advance of finalization of the remote identification rule. More specifically, we will establish a cooperative data exchange mechanism between the FAA and the Remote ID USSs. Addressing the data exchange issues in advance of the final rule will ensure that the infrastructure is in place so that once the rule is finalized, the timeline for actual implementation of the rule will be reduced. Responses from the RFI are being evaluated.

UAS Remote Identification Rulemaking. Remote identification of unmanned aircraft systems is essential for secure operations and is critical for addressing improper drone operations and accountability. With rapidly expanding deployments of unmanned aircraft systems, the need for Federal UAS guidelines becomes more urgent.

At the Senate Commerce Committee May 8, 2019 hearing, FAA officials stated multiple times that FAA is working toward the schedule of a July 21 release of a proposed UAS rule and further noted that FAA is simultaneously working on the
rule, standards that support the rule and implementation of the infrastructure build-out.

**Question 3.** Is FAA confident it will issue a rule by July 21?

**Answer.** The FAA is working on a notice of proposed rulemaking (NPRM) on remote ID, which is currently scheduled to be published in September 2019.

**Resources to Assist Farmers’ Use of Drones.** Drones, which can gather real-time information about plant conditions, stressed areas, pest infestation and plant growth, offer farmers a cost-effective way to monitor crops.

**Question 4.** Given that use of drones for agricultural purposes is designated a commercial activity, what is FAA doing to facilitate farmers undergoing operator training in order to obtain a remote pilot certificate or provide informational resources about available operators for hire?

**Answer.** The FAA has a number of online resources on our website that are targeted specifically to get new drone operations up and running. In addition, we have a number of informational or ‘How To’ videos on the FAA’s YouTube channel that focus on more specific topics including operational requirements and airspace familiarization. The FAA’s FAASTeam also provides a number of online resources to prepare prospective remote pilots to pass the certification exam that part 107 requires. In addition, pilots who already hold another type of pilot certificate only need to complete training under part 107 to obtain a remote pilot certificate. Such pilots can also take advantage of the resources the FAA provides for remote pilot education.

**Foreign Manufacturer’s Dominance in U.S. Drone Market.** The demand for drones by U.S.-based commercial and recreational users in the United States is rapidly expanding. The number one supplier of drones in the U.S. market is the Chinese company DJI or Da-Jiang Innovations. Industry analysts estimate that DJI has captured up to 85 percent of the commercial drone market in the United States.

**Question 5.** Given drones’ expanding scope of applications and field of operations, is FAA looking at the security implications of a Chinese company’s near absolute dominance as a supplier in the U.S. drone commercial market?

**Answer.** FAA considers cyber and data security risks and mitigations in every aspect of our mission, including as they apply to aircraft certification and systems, as well as protection of our own air navigation services infrastructure. While UAS are aircraft, they are also like so many highly computerized devices we use in our professional and personal lives that can collect data and connect to the Internet where information systems and data can be vulnerable to misuse if they are not adequately protected. UAS operators, just like computer users, need to be aware of what data is on their system and consider what level of protection it should be afforded. The FAA strongly recommends that anyone flying a UAS read the user licensing agreements on their drones and assess whether the data access, sharing, and protection policies the manufacturer has in place are adequate or whether their data sensitivity necessitates additional protection from disclosure and misuse. The FAA is also looking at agreements the Agency has with non-federal UAS service suppliers to ensure protection of data and transparency about how that data is used.

- Is FAA engaging other Federal national security agencies on this topic?

**Answer.** Yes, the FAA works closely with our Federal national security partners on cyber and data security threats and risks, including those related to UAS. The FAA, along with the Departments of Defense and Homeland Security, are currently partnering on the Aircraft Cybersecurity Initiative, which includes UAS-focused efforts as part of its 2019 work plan.

**Length of Controllers’ Workweek.** Experts cite that mandatory six-day workweeks for controllers is a major challenge to operating the National Airspace System efficiently and safely.

**Question 6.** What does it take to pare back to five-day workweeks for controllers?

**Answer.** The FAA restricts the number of hours a controller can work in a day, and controllers must have at least one day off (24 hours) at least once every seven days—meaning they cannot work more than six days in a row. Certain facilities, however, are experiencing lower certified professional controller levels largely due to retirements. At those facilities, some controllers are working six-day workweeks to meet the operational needs and delivery of services. We have increased our emphasis on training our newly hired air traffic control specialists so they will be fully certified in their positions, which will allow us to decrease the occurrence of six-day workweeks.
Included in last year’s FAA reauthorization bill that was signed into law was lan-
guage that stated that the FAA shall “streamline to the extent practicable the ap-
proval process for test ranges when processing unmanned aircraft certificates of 
waiver or authorization for operations at the test sites.” Based on my conversations 
with industry stakeholders back home in Nevada, I am hearing that FAA has not 
indicated that it will be streamlining its waiver applications, as the law now re-
quires.

**Question 1.** Can you commit today to following the language of the reauthorization by streamlining the approval of applications for operations at test sites?

**Answer.** The FAA is fully committed to streamlining operational approvals for UAS Test Site operations, and meets weekly with several test sites, including Ne-
vada, to ensure they have access to the regulatory expertise and process information 
they need to submit high quality applications in a timely manner. This ensures that 
the Test Sites get the approvals they need to meet their scheduled commitments.

Part of the topography of a state we need to consider when testing UASs, besides 
tall structures and buildings, is also the presence of mountain ranges. Nevada hap-
pens to be the most mountainous state in the lower forty-eight, and the City of Reno 
is an example of the challenge of testing UAS technology in all types of terrain. As 
Reno continues to expand its UAS footprint, “beyond visual line of site” operations 
will surely be necessary for the full integration of UAS.

In addition, the test sites provide a vital resource to innovate by offering services 
to conduct more advanced UAS flight testing. Their expertise is being utilized with 
several UAS Integration Pilot Program (IPP) participants, as well as the UTM Pilot 
Program.

**Question 2.** How is the FAA helping test sites advance beyond visual line of site operations?

- **Have you provided, or will you provide, guidance to test sites regarding beyond visual line of site operations, and can you explain how one would get this type of waiver?**

  **Answer.** The FAA meets with the test sites regularly, often on a weekly basis, to 
ensure they have access to the regulatory expertise and process information. The FAA also holds two Technical Interchange Meetings (TIMs) with the Test Sites 
yearly, during which FAA subject matter experts brief the Test Sites on all new 
policy developments, process changes, and other integration activities, to ensure 
they have the latest information and can discuss their specific operational needs 
with the regulators. We have provided guidance regarding all manner of operations, 
including beyond visual line-of-sight (BVLOS) and over people, to ensure the Test Sites understand the regulatory options for pursuing these types of operations.

- **When will you be releasing more information on beyond visual line of site?**

  **Answer.** The FAA is working on a UAS-specific safety risk management Order 
that will provide a framework to evaluate applications for waivers and exemptions 
to conduct novel operations, including BVLOS. This Order will permit consistent 
evaluation of safety information and establish criteria for risk-based agency deci-
sions. We anticipate issuing the Order, which will be available on FAA.gov, prior 
to the close of FY 2019.

The FAA currently considers applications for BVLOS under existing regulations 
using waivers and/or exemptions. Guidance for waivers is available on the FAA’s 
website and through the DroneZone portal. Exemptions are considered on the basis 
of the safety justification an applicant makes and are specific to the operator’s oper-
ational concept; however, both the applicant’s petition and the FAA’s analysis and 
decision are published on the regulatory docket for others to evaluate.

The FAA has enabled multiple limited BVLOS operations that have been based 
on operational constraints and low risk areas. We are actively working towards 
gathering more information on technological solutions that will allow for UAS to de-
tect and avoid other aircraft. Remote ID will be a major foundation for the “detect” piece of that effort.

Further, the FAA is actively working across numerous programs, including our In-
tegration Pilot Program, our Partnership for Safety Plan (PSP) Program, the UAS 
Test Sites, the UAS Center of Excellence, and others, to enable BVLOS operations 
in a safe and secure manner. The FAA intends to provide robust, flexible rules and 
policy, to support scalable operations such as BVLOS in the future.
RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. AMY KLOBUCHAR TO WAYNE MONTEITH

In Fiscal Year 2018, the United States saw a record 32 launches and 3 reentries of commercial space vehicles. In Fiscal Year 2019, the FAA anticipates as many as 44 launch and reentry operations—a potential increase of over 25 percent.

Question 1. What steps is the FAA taking to improve its processes and adapt to rapidly changing commercial space technology?

Answer. We recognize that our current processes are not sufficient to meet the needs of the future. Several efforts are currently underway to address the anticipated growth in both licensing activities and operations in coming years. Our office has been working diligently over the last year to consolidate and update existing regulations to respond to the evolution in the commercial space transportation industry we are seeing today. After gathering industry input, we published a proposed rule in April that aims to consolidate, update, and streamline all launch and reentry regulations under one single, performance-based regulatory framework. We believe this construct will ensure public safety, while also accommodating innovative technologies and approaches. Once final, this rule will allow for the differentiation between types of vehicles and operations, licensing of multiple launches from multiple locations under a single license, and incremental submission of applications.

In addition to these regulatory reforms, we are also reviewing our internal processes to enable more effective and efficient evaluation and issuance of licenses, providing appropriate safety oversight and ensuring greater accountability. This review includes initial work to assess how we can more fully automate the licensing process.

At the same time, we are also using Lean Transformation principles to improve our internal evaluation processes as well as supporting business processes. These principles will better enable our ability to assess new technologies and procedures that will likely be introduced through performance-based standards.

As part of that process, we are reorganizing the Office of Commercial Space Transportation. While the organization has done and continues to do great work to meet the demand of industry, the office developed at a time when commercial space was a far different activity than it is today. We are examining how best to position and align our people, processes, technology, and organization to best support a rapidly changing industry and our new proposed streamlined licensing rulemaking.

We are also working to streamline processes at Federal ranges. As a first step, we are working with the Department of Defense and NASA to prioritize standards and requirements to use these as a basis for our next generation site licensing framework. We want to ensure that we understand the fundamental requirements needed at these sites, so that we can preserve critical range assets and effectively streamline regulatory requirements on commercial operators, as we move towards a new paradigm in oversight of commercial launches at Federal ranges.

Finally, we are taking steps to engage more fully with industry as we move toward more effective integration of operations into the national airspace system. We believe that industry may already have systems that can be leveraged to potentially reduce the lengthy acquisition and implementation timeframes.

Question 2. What steps is the FAA taking to maintain high safety standards for the commercial space industry in light of this accelerated growth?

Answer. The primary mission of the Office of Commercial Space Transportation is the safety of the uninvolved public. The FAA must also consider the safety, capacity and efficiency of the national air transportation system. In over forty years, no individual not directly involved in a launch or reentry has died or been injured in a commercial space transportation accident. To maintain this safety record as we move to a more performance-based oversight, we will continue to use the ground, flight, and system safety standards that have proven effective in the past. We also believe that new technologies and procedures will help us to more safely and effectively integrate commercial space transportation operations into the U.S. National Airspace System.

We are also enlisting industry in this area. The Commercial Space Transportation Advisory Committee—COMSTAC—has a safety working group that, among other things, is looking at how industry can provide safety data to enable us to analyze potential problems and fix them before they occur. This is modeled on the aviation community’s voluntary safety reporting effort and we believe it will work as well with the commercial space industry.
RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER WICKER TO
ERIC STALLMER

Question 1. Respond to the recommendation to “Immediately emphasize and accelerate efforts to efficiently integrate space vehicle operations into the National Airspace System (NAS).”

Answer. FAA has successfully integrated space vehicle operations into the NAS, and continues to develop tools and processes to integrate future operations more efficiently.

The FAA works with launch site operators, commercial launch and reentry vehicle operators, air carriers, and other government agencies such as the Department of Defense before and during each launch and reentry. FAA minimizes the effects of these operations on the NAS using a variety of techniques, such as dynamically tracking and rerouting only those aircraft that might be affected by potential debris, opening up portions of hazard areas as they become safe, and maintaining communications with all stakeholders during operations. In 2014, the FAA created the Joint Space Operations Group at the FAA Air Traffic Command Center in Warrenton, VA. This group includes both aerospace engineers with subject matter expertise in space operations as well as air traffic specialists, ATC facilities, and other stakeholders to develop airspace management plans. The group works together to support space operations and manage the airspace as actual operations occur. This group supports each launch and reentry, monitoring operations progress and standing ready to lead the FAA response to contingencies. The Challenger Room where these operations are housed is the first dedicated operational space for integrating commercial space operations into the airspace.

In addition, the FAA’s William J. Hughes Technical Center in Atlantic City, NJ, stood up the agency’s first dedicated commercial space lab in 2016 to develop concepts and prototypes for new technologies that can help better integrate commercial space into the NAS. This includes the Space Data Integrator prototype, which has been instrumental in validating the FAA’s foundational requirements to integrate commercial space into the NAS. The goal of this prototype is to demonstrate how to automate several of FAA’s current manual processes for coordination during commercial space launches and reentries. It is currently the only FAA system capable of acquiring and displaying launch/reentry data to the FAA’s Joint Space Operations Group. We work with industry partners such as SpaceX and Blue Origin to demonstrate capability during launch/reentry operations. Once operationalized, this system will enable FAA to safely reduce the amount of airspace that must be closed to other users, respond to off-nominal scenarios and during normal operations, and release airspace that is no longer at risk as the mission progresses.

The FAA is exploring approaches and capabilities required to produce real-time Aircraft Hazard Areas (AHAs). FAA has developed the Hazard Risk Assessment Management (HRAM) prototype to demonstrate that the time required for AHA calculation and display could be reduced from several minutes to seconds. The FAA has integrated the HRAM prototype with the SDI prototype in the Commercial Space Lab at the Tech Center in Atlantic City, demonstrating its capability in a beta-test “shadow mode” during live SpaceX and Blue Origin operations.

Finally, the FAA has created the Commercial Space Transportation Executive Working Group, made up of senior executives across the agency who meet regularly to discuss cross-cutting initiatives associated with commercial space. This group plays a crucial leadership role in developing new commercial space integration initiatives, such as the recent Commercial Space Integration into the NAS Concept of Operations document.

Question 2. Respond to the recommendation to “Establish a space operations committee (including operators, Department of Defense, and NASA) to recommend appropriate information to be exchanged with the FAA for more dynamic airspace management and situational awareness.”

Answer. FAA currently works with all the stakeholders listed, both before and during launches and reentries, to ensure the exchange of all needed information. For example, prior to each operation, the Joint Space Operations Group exchanges information with stakeholder and Department of Defense representatives at the Command Center, in the form of operation-specific Airspace Management Plans. These plans are also briefed on Operational Planning Teleconferences. Beyond these efforts, we look forward to working with the Commercial Spaceflight Foundation and other stakeholders to identify additional data that may be used to enhance situational awareness for all stakeholders.
Question 3. Respond to the recommendation to “Establish a Steering Committee to provide ongoing input to the FAA as NAS improvements are developed and implemented.”

Answer. Based on the results of the Airspace Access Priorities Aviation Rulemaking Committee, the FAA is considering the need for a new Steering Committee. Such a committee may be redundant, however, because the FAA currently works with all stakeholders, including major stakeholders in commercial space transportation before and during launches, to ensure that all needed information is exchanged. Further, the Commercial Space Transportation Advisory Committee (COMSTAC) provides an additional avenue for input to the FAA on this subject. The recent addition of representatives from Airlines for America and the Airports Council International—North America has increased COMSTAC’s focus on these issues.

Question 4. Respond to the recommendation to “Invest in developing tools and capabilities that will enable a future NAS state where air traffic management shifts from segregation to integration with separation assurance.”

Answer. The FAA envisions the shift from segregation to integration as an evolution, enabled over time by a number of key factors. New tools and capabilities are important enablers of dynamic airspace management, and the FAA is exploring the use of non-traditional acquisition approaches and public-private partnerships to leverage capabilities and resources that already exist in the commercial space and aviation industries to increase the pace of integration. Close collaboration across these industries and government agencies will be critical to success. New policies, procedures, training, and regulations will also be needed. But just as critical, the launch and reentry vehicles must become increasingly more reliable, and the manner in which they are operated must become increasingly more predictable. The FAA has developed a Commercial Space Integration into the NAS Concept of Operations document that describes this evolution. We anticipate releasing it for public comment in 2019.

Question 5. Respond to the recommendation to “Implement the ability to create dynamic airspace areas on controller automation systems that can be conflict probed.”

Answer. In 2019, the FAA initiated a new program called Space Integration Capabilities (SIC). This program will develop a series of work packages that will increase the Air Traffic Organization’s technical capabilities for integrating commercial space into the NAS. Work Package 1 contains a number of elements, including a “rapid aircraft hazard area” (AHA) ingestion capability that will build upon the Space Data Integrator’s capabilities, extending the distribution and display of aircraft hazard areas from the Traffic Flow Management System (TFMS) to controller automation systems, such as the En Route Automation Modernization (ERAM) and Standard Terminal Automation Replacement System (STARS). Real-time hazard area volumes will be integrated into existing NAS systems. Once displayed on automation systems, a controller will be able to address these airspace areas in the same manner as other special activity airspaces, including capabilities for conflict probing.

Question 6. Respond to the recommendation to “Implement decision support tools in automation systems for air traffic controllers and traffic managers.”

Answer. In 2019, the FAA initiated a new program called Space Integration Capabilities (SIC). This program will develop a series of work packages that will increase the Air Traffic Organization’s technical capabilities for integrating commercial space into the NAS. Work Package 1 contains a number of elements, including a decision support and hazard mitigation of affected aircraft capabilities. Traffic managers and controllers will receive automatic, advanced notifications of airspace activation and deactivation, further enabling time-based flow management procedures. In the event of a launch or reentry vehicle failure, controllers will receive recommendations for prioritizing response actions and conflict-free resolutions based on the changing nature of risk to each aircraft. The SIC Work Package 1 is scheduled for an Investment Analysis Readiness Decision in 2019.

Question 7. Respond to the recommendation to “Develop procedures and training to enable future automation capabilities.”

Answer. For any development of new capabilities, and for significant enhancements of existing capabilities, the FAA must review and revise its procedures. Changes to procedures prompt training for the users of these capabilities. These activities are part of the FAA’s normal processes.

Question 8. Respond to the recommendation to “Further develop its Hazard Risk Assessment and Management (HRAM) capability and make that tool available to ATC to allow dynamic airspace management.”

Answer. In 2014, the FAA developed a Hazard Risk Assessment and Management (HRAM) prototype to facilitate a series of human-in-the-loop tests conducted in the
NextGen Integration and Evaluation Capability (NIEC) lab at the Tech Center in Atlantic City. These sophisticated series of tests used actual controllers in simulated ATC environments to successfully validate the responsive approach to airspace management during launch and reentry operations. The HRAM prototype was a key component of these tests, providing a capability to generate an AHA in real-time in just a few seconds, versus current toolset, which requires several minutes to complete the same computation. The FAA is exploring the development of a Real-time Aircraft Hazard Area (AHA) Generator capability as a second phase of the Space Data Integrator (SDI) program. The HRAM prototype represents one of several means to implementing the necessary capability that the FAA continues to explore. The second phase of the SDI program is scheduled for an Investment Analysis Readiness Decision in 2019.

Question 9. Respond to the recommendation to “Implement and enable a capability, such as the Space Data Integrator (SDI) that allows space operators to share telemetry data with ATC systems and use that tool to supply telemetry to HRAM and other automation platforms as necessary.”

Answer. The FAA began the Space Data Integrator (SDI) project in 2014, developing a proof of concept system that it has exercised in “shadow mode” during ongoing launch and reentry operations. The SDI capability will receive launch and reentry vehicle data from available sources, including telemetry, process the data for ingestion in to FAA systems, and display it for use by the Joint Space Operations Group and traffic management coordinators at affected ATC facilities in maintaining situational awareness. A Real-time Aircraft Hazard Area (AHA) Generator capability, such as the Hazard Risk Assessment Management (HRAM) prototype, will rely on an SDI capability for required inputs. The FAA’s Traffic Flow Management System (TFMS) and other systems will also rely on an SDI capability for input. The FAA is currently exploring options to accelerate deployment of the SDI.

Question 10. Respond to the recommendation to “Implement a NAS operational airspace utilization assessment for both planning and post analysis capability and make it available to operators online.”

Answer. Currently, pre-mission planning is a serial process, which addresses airspace considerations very late, when few options remain available to explore alternatives in the timing and duration of operational windows. These plans are often distributed within days or hours of the operation, when other stakeholders can no longer consider adjustments in response to the operation. In the future, the FAA envisions a collaborative process, built on capabilities already in use by the commercial space and aviation industries, to “trial-plan” operations against system constraints, take advantage of flexibility where it is available in operational window timing and duration, and distribute plans amongst all stakeholders much earlier, when adjustments are still possible. Post analysis capability will provide quantitative metrics for use in future optimization of this process. The FAA is conducting early concept development of pre-mission planning and post-mission analysis capabilities. The FAA anticipates that collaborative decision making and associated cross-industry forums will provide opportunities for significant industry participation in vetting these concepts and bringing existing capabilities to the table.

Question 11. Respond to the recommendation to “Require minimum advanced notification times prior to an event requiring Special Access Airspace (SAA).”

Answer. The FAA recognizes that other NAS users require advanced notification of launch and reentry operations in order to consider and implement changes to their plans. Under some situations, Notices to Airmen may not provide sufficient notice. To address this need, the Joint Space Operations Group distributes airspace management plans to stakeholders several days in advance of the operation. Further, in the days and hours prior, the Command Center publishes advisories and discusses its plans on Operational Planning Teleconferences. Going forward, the FAA will continue to work with all stakeholders to evaluate and adjust timelines as needed.

Question 12. Respond to the recommendation to “Ensure sharing of real-time status of the vehicle for both pre- and post-launch.”

Answer. The Joint Space Operations Group currently utilizes hotlines during launch and reentry operations to receive and distribute operational status information. A requirement for the use of a hotline is being included in the letters of agreement between site and vehicle operators and ATC that are required for licensing and permitting of commercial space operations. Going forward, a Space Data Integrator (SDI) capability will supplement this information and automate its distribution to stakeholders.
Question 13. Respond to the recommendation to “Implement procedure updates for tactical information exchange between operators and FAA regarding on-time operations to enable more dynamic airspace activation/deactivation.”

Answer. The Command Center is in the process of implementing time based flow management procedures for launch operations from the East Coast. These procedures will use the timing of key events in the countdown and execution of launches to initiate reroutes and release airspace back to normal use. A requirement for the use of a hotline between the vehicle operator and ATC is a key enabler of these procedures. Going forward, the FAA envisions Space Data Integrator (SDI), Real-time Aircraft Hazard Area (AHA) Generation, and Space Integration Capabilities further enabling more dynamic airspace activation/deactivation.

FAA is moving toward successfully integrating space vehicle operations into the NAS, and continues to develop tools and processes to more efficiently integrate future operations.

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