

**FAA REAUTHORIZATION:  
INTEGRATING NEW ENTRANTS INTO THE  
NATIONAL AIRSPACE SYSTEM**

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**HEARING**

BEFORE THE

SUBCOMMITTEE ON AVIATION SAFETY,  
OPERATIONS, AND INNOVATION

OF THE

COMMITTEE ON COMMERCE,  
SCIENCE, AND TRANSPORTATION  
UNITED STATES SENATE

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

SEPTMBER 28, 2022

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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**WEDNESDAY, SEPTEMBER 28, 2022**

U.S. SENATE,  
SUBCOMMITTEE ON AVIATION SAFETY, OPERATIONS, AND  
INNOVATION,  
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,  
*Washington, DC.*

The Subcommittee met, pursuant to notice, at 2:24 p.m., in room SR-253, Russell Senate Office Building, Hon. Kyrsten Sinema, Chairman of the Subcommittee, presiding.

Present: Senators Sinema [presiding], Cantwell, Rosen, Cruz, Wicker, Thune, Moran, and Lee.

**OPENING STATEMENT OF HON. KYRSTEN SINEMA,  
U.S. SENATOR FROM ARIZONA**

Senator SINEMA. Welcome to the Senate subcommittee on Aviation Safety, Operations and Innovation. Thank you all for joining us today to hear testimony from stakeholders regarding innovative aviation technologies and new entrants to the national airspace system. New entrants include innovations in advanced air mobility, electric vertical takeoff and landing aircraft, and uncrewed aerial systems commonly known as drones.

These technologies have a wide range of applications, from inspecting critical infrastructure to delivering medicine in remote areas, to improving mobility in urban areas. Along with advancements in electric propulsion, these innovative approaches offer opportunities to transport passengers and cargo, or to provide other aviation services while reducing carbon emissions.

As we begin the process of reauthorizing the Federal Aviation Administration next year, Congress should incorporate provisions to advance these important developing technologies. And our hearing today is an opportunity to consider the challenges ahead and the approaches Congress can take to address those challenges.

Advanced air mobility is an exciting technology that has the ability to completely reshape the future of aviation. Analysts estimate that the AAM market in the United States could reach \$115 billion in the next 10 years, increase the public's access to aviation, and strengthen national security while contributing far less greenhouse gas emissions than current aviation technologies.

Given these benefits, there is widespread global interest from countries in Europe, Asia, and elsewhere to lead on AAM tech-

nologies, and the United States needs to develop a plan to be the global leader of this technology. There are similarities between AAM, and the bipartisan work Congress did in the recently enacted Chips and Science Act.

Working with many of my colleagues from this committee, including Chair Cantwell, Ranking Member Wicker, and Senator Young, we helped support domestic manufacturing for semiconductors and drastically improved Federal research and development for innovative science and technologies.

As AAM continues to advance, Congress and the Federal Government must position the United States to be the global leader of this technology. We must have a regulatory framework that ensures the safety of passengers and people on the ground, while creating an inviting ecosystem for domestic AAM manufacturing and operations here in the United States.

That is why I welcomed the opportunity to join my Commerce committee colleague, Senator Moran, to introduce the Advanced Air Mobility Coordination and Leadership Act. Our legislation will develop an interagency working group to evaluate, plan, and coordinate efforts regarding the safety, infrastructure, and security of developing AAM in the United States.

The Department of Transportation will lead this working group but given the technical complexity of this industry and the many beneficial uses, we will incorporate expertise from across the Federal Government to advance this effort on a broader scale. Our legislation passed the Senate unanimously on September 21 and will soon head to the President's desk.

I look forward to our legislation becoming law so DOT and many other agencies can begin their work without delay. The Moran, Sinema AAM leadership bill is just the first step. In order to ensure safety, the FAA needs to provide clarity and certainty to the entrepreneurs and innovators who are developing this new technology.

Earlier this year, the FAA changed the path for certification of these AAM aircraft, which created confusion among stakeholders. Looking ahead in order to provide certainty, the FAA needs to promulgate timely regulations to ensure that commercial operations occur safely, that pilots are trained appropriately, and that the aviation workforce will be ready to fill the AAM jobs of the future.

The United States will also need additional infrastructure in order to safely and effectively integrate AAM into our national airspace. I was proud to lead negotiations on the bipartisan infrastructure law known as the Infrastructure Investment and Jobs Act, which invested \$25 billion in aviation infrastructure over 5 years.

These investments will fund improvements at every airport across the country, while rebuilding and modernizing air traffic control infrastructure. As I visit airports across Arizona, I am starting to see the benefits of these historic investments.

This week, the FAA released vertiport design standards to safely integrate AAM into airports. Today, our panelists will provide their thoughts about the infrastructure, including electric charging infrastructure needed for a robust AAM build out. Today's hearing will

also focus on drones and developing the drone economy of the future.

Like AAM, this is another area where we need to maintain American leadership and build upon previous successes. Interest in drones from both the commercial and recreational perspective remains strong. As of January 2022, over 860,000 drones have been registered with the FAA, along with over 260,000 drone pilots.

Drones are providing crucial services to Arizona and throughout the Nation. They can deliver essential cargo such as medicine to rural areas and tribal communities. Drones also have the ability to monitor and inspect vital infrastructure, including pipelines, electric transmission lines, and railroads for routine maintenance and after natural disasters when conditions may not be safe for human inspectors.

This is a promising track record, but again, there is more work to do if the United States has to remain ahead of foreign competitors. For example, Congress can work with aviation stakeholders and the FAA to expedite regulations for safe drone operations beyond visual line of sight, which may be still years off.

Additionally, we will hear today from leaders in electric propulsion, which presents an opportunity to reduce noise levels of aircraft while simultaneously minimizing carbon emissions from aircraft engines. Our committee will benefit from learning more about electric aircraft and any barriers developers face that hinder the growth of this technology.

We have an excellent panel today, with witnesses representing industry and thought leaders across the AAM, drone, and electric propulsion industries. Our witnesses will advise us on Congress's role in boosting these sectors, creating jobs, and securing American leadership in the aviation advances of the 21st century.

Thank you all for joining us today. And now I would like to turn it over to Ranking Member Cruz for his opening statement.

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

Senator CRUZ. Thank you, Madam Chair. And I appreciate you are holding this hearing today. This is a critically important issue, and one that frankly I don't know that we have given nearly enough attention to.

From drones to air taxis to new propulsion systems, the aviation enterprise is filled with new and exciting technologies that promise to transform how we live and how we work. Whether it is delivery drones getting medications to seniors in the most rural parts of the country, or industrial drones doing long distance pipeline inspections to ensure the safe transportation of oil and natural gas, new vertical takeoff and landing vehicles enabling low cost short haul air transportation and reducing congestion in cities, or new propulsion technologies which will use less fuel or even new fuels to go farther with less, it is an exciting time to be in aviation.

But as I am sure our witnesses will discuss today, everyone in this space is facing a similar problem, uncertainty. And while the issues facing the FAA are numerous and many of them are very complex, the inability of the agency to do its job and to manage the

national airspace system is threatening to cut American innovation and global leadership off at the knees.

Whether that is on the certification front for new platforms, rules for remote ID or operations beyond visual line of sight, integration into the air traffic management enterprise or any number of other issues, our regulatory system too often is paralyzed with indecision.

They are exceedingly complex and would present a challenge for even the smartest and most well-equipped. But some days the FAA seems unable to do even the most basic parts of its job. And I think especially more recently, this is in no small part due to a lack of leadership both at FAA and at DOT, and a lack of interest on the part of the White House. Just take a look at the FAA's organizational chart.

Throughout the agency, there are more than a dozen important roles being filled by acting officials, including the very top spot. They are in places like the Aviation Safety Office, the Air Traffic Organization, the Assistant Administrator for NexGen, the International Affairs Office and Air Traffic Safety Services.

Even when the Administration finally sends us a nominee for FAA Administrator, they send someone with almost zero aviation experience, a requisite for the job, and who has recent news as highlighted, has more than a little bit of scandal surrounding him.

It is more than a little rich watching the Transportation Secretary beat up on the airlines when he seems to simultaneously ignore the absolute hollowing out of the FAA and the lack of confirmed permanent leadership over there.

Somehow, Secretary Buttigieg has the time and resources to run around the country cutting ribbons on infrastructure projects and to launch a new, "airline customer service dashboard," but can't find the time to fill critical vacancies at the FAA.

The Secretary hasn't even responded to questions for the record from his budget hearing in May of this year, 5 months ago. And look, I get that you, the panel before us, you don't represent the FAA. But I don't know how you look at what I just outlined and think that anyone in this Administration is placing aviation at the top of their priority list.

Even as we are meeting here today, there are still dozens of rules and reports from the last FAA reauthorization, in 2018, that still haven't been done. One thing I authored, the Commercial Balloon Pilots Safety Act, which simply requires the FAA to require a medical certificate for commercial balloon pilots, and which was the result of a horrific balloon crash in Texas, and recommendations from the NTSB, still remains incomplete years after we passed it in law.

In fact, it wasn't until November of last year that the FAA even issued a notice of proposed rulemaking, 3 years after the 2018 reauthorization. If the FAA can't even get something like this done, commercial air balloon safety how exactly are we supposed to have faith that they can get the much more complex tasks around integrating new entrants done, let alone done in a timely and efficient way?

So I look forward to hearing from our witnesses what they think about what needs to be done. If it is more resources for the FAA, faster regulatory timelines, organizational shake ups, we are all ears.

Congress has almost always taken a collaborative approach in aviation regulation, directing the FAA to go through a rulemaking to get stakeholder input in shaping and crafting regulations based on feedback. But in this space, where emerging technologies are meeting an old and entrenched bureaucracy, we are very quickly getting to a point where something has to give.

And I, for one, am determined that what gives will not be continued American leadership in aviation. Thank you.

Senator SINEMA. Thank you. I now recognize the Chair of the Full Commerce Committee, Senator Cantwell, for an opening statement.

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

The CHAIR. Thank you, Chair Sinema. Thanks for sharing this important hearing along with your colleague, Ranking Member Cruz, and the important witnesses that we are having today. I also want to thank you, you mentioned the Chips and Science Act, and I want to thank you for your help and leadership in the final days of our negotiations in getting that done.

Today, we are here to hear from a set of witnesses to talk about the current issues of aviation and the fact that an FAA bill is due for reauthorization next year. This is an opportunity to talk about the prospects of that and what needs to be addressed. Today's hearing will specifically examine how Congress can help advance aerospace safety and innovation, and what we need to do for the future, whether that is drones to new air mobility concepts.

So I look forward to hearing from all of the witnesses. I am especially happy to hear from Gregory Davis, President and CEO of Eviation. I want to congratulate Eviation on yesterday's first flight of Alice, the first time an all-electric consumer aircraft built from the ground up took flight.

I wish we had time to show the video from it, because you can hear a lot of cheers at Moses Lake from everybody there for this historic occasion. This groundbreaking aircraft took flight from a 13,000 foot runway at Moses Lake Flight Test Center in the heart of Washington, along with local partner companies like MagnetX and Aerotech. I can see why this project has been so successful.

Electric aircraft like Alice, built using 95 percent composite materials, represent an inspiring promise of American built innovation and exciting future of sustainable aviation. Locations like Moses Lake show how a combination of public infrastructure and private sector ingenuity create a hotbed for developing next generation aerospace technology.

Eviation and Advance Air Mobility Concept provide an opportunity to expand connectivity to regionally and underserved communities and airports. We know that all—I am sorry, we know that half of all flights in the U.S. are less than 50—sorry, 500 miles in range.

So yesterday's successful integration test flights prove the concept, that we have sustainable aviation technology and that it can transport people to these short and middle mile regional routes. This significantly can reduce the aviation industry's environmental impacts in terms of carbon emission and noise pollution, and

achieving the technical milestones enables companies like Eviation to focus on commercialization of aircraft like Alice, in line with the evolution of battery technology, something that was a very key part of the Chips and Science Act.

And the FAA certification process will also have to be there to move forward on the all-electric flight if it is to become an industry standard. But for me, I think the CEO has said it best, that these new opportunities for places like Seattle to Walla Walla, or maybe Spokane to Missoula, or Moses Lake to parts of Oregon or California, are now the kinds of things that would be more economical with these kinds of flights.

Electric planes can connect regional communities in ways previously not possible. There are more than 2,000 underutilized airports in the United States, and noise restrictions that cover more than 200 airports in the United States alone. So Congress has made significant progress to empower this kind of innovation and dynamics, and we need to continue to work to help those opportunities move forward.

The 2022 Inflation Reduction Act provided a grant program to develop sustainable aviation fuel and also to incent other types of manufacturing like electric. Because of our success in passing the Chips and Science Act, \$280 billion is authorized to bolster innovation, create new regional tech hubs, and make historic investments in basic research and translational science.

So we know that investing in innovation will help us for tomorrow. Another innovation are the new entrants in aviation. For example, drones, one of the fastest growing segments of aviation in the United States. Over 860,000 drones have been registered with the FAA. And as of January, over 260,000 remote pilots have been certified.

The FAA expects this number of registered drones to grow as high as 2.3 million by 2024. The use case for drones continues to grow well beyond the package delivery to include surveying, infrastructure inspection, precision agriculture, weather monitoring, and even disaster response.

The Association for Uncrewed Vehicle Systems International forecasts that between 2015 and 2025, civilian drones will add \$82 billion to the U.S. economy, along with 103,000 new, high paying jobs that do require a technical degree. So additionally, U.S. based manufacturers are busy designing and building electric vehicle aircraft with vertical takeoff and landing capability.

These operations can take off like a helicopter, my colleagues before me have mentioned this, and then fly to a fixed wing airplane. According to Deloitte, the AAM market in the United States is estimated to reach \$115 billion by 2035, 0.5 percent of the country's current GDP, and create more than 280,000 paying jobs by 2035.

Importantly, AAM and alternative propulsion technologies are environmentally friendly and have—and a must have for the industry's future. Aviation contributes 12.5 percent of U.S. transportation emissions and accounts for 3 percent of the Nation's total greenhouse gas production. So dealing with these issues is going to be vitally important for the future.

So I look forward to hearing from my colleagues and thinking about the future of aviation. But as my colleagues have pointed

out, it does require strong leadership from the FAA. The bill that Senator Wicker and I passed, that we expect and will continue to have oversight over the FAA to get the right policies in place, get the right people in place, and continue to focus on security as well as competitiveness.

Security will—security will help us be the leaders in aviation, and I hope that we can talk about how to continue to maintain that as we move forward with the reauthorization. I thank the Chair.

Senator SINEMA. Thank you, Chair. I now recognize the Ranking Member of the Full Committee, Senator Wicker, for his opening statement.

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

Senator WICKER. Thank you, Madam Chairman. And I say to the members of the panel, surely you must realize eventually you are going to get a chance to talk at this hearing. But I do want to thank Senators Sinema, Cruz, and Cantwell for convening this hearing of the subcommittee and beginning work on reauthorizing the FAA for next year.

Today, there are 900,000 registered drones and—used for recreational and commercial purposes. These drones perform a wide range of valuable tasks: cargo delivery, aerial photography, information gathering, and geographic mapping. During the recent pandemic, emergency waivers granted by the FAA provided a positive indication of the potential of drones.

Operating safely outside the normal rules, we witnessed fleets of drones delivering food and medicine to those quarantined at home, giving us a window into the future. Drone use during the pandemic also highlighted the importance of R&D for improving safety and performance.

In partnership with the FAA, universities and industry are now helping to enhance the drone traffic management systems, air traffic control, interoperability, safety, and pilot training. I am proud that my home State of Mississippi and the Mississippi State University lead a consortium called Assure to carry out much of this critical R&D.

In 2015, the FAA designated Assure as the agency's Center of Excellence for drone R&D and recently agreed to extend that role through May 2025. I want to recognize Assure's Executive Director, retired Air Force Colonel Steve Luxion, who is one of our witnesses today. I hope Colonel Luxion will touch on some of the important research carried out by Assure and how it will help integrate drones into our airspace in a safe manner.

Just as drones are becoming commonplace, another suite of aviation technology known as Air—Advanced Air Mobility, or AAM, is emerging. AAM is not a single technology, but rather a collection of technologies applied to the aviation system. AAM vehicles have many potential uses, such as transporting passengers, as Senator Cantwell has alluded, moving cargo, assisting firefighters, and connecting rural communities to larger cities.

Electric powered aircraft or air taxis, for example, may someday be able to airlift people like me across town or to the airport in a matter of minutes. Much of the basic technology for AAM aircraft

is already developed. The FAA should begin certifying AAM vehicles as early as 2024. The industry has now shifted its focus to infrastructure and workforce development and the regulatory process.

The last FAA Reauthorization Act helped pave the way for expanded drone use. I hope next year's bill will do the same for AAM. In that vein, the Committee would benefit from our witnesses' perspective on regulatory and policy questions we should tackle in the next reauthorization bill.

As we gather inputs for reauthorization, we should be mindful of the safety, efficiency, and security of new technologies while at the same time continuing to promote innovation in this vital sector. Thank you, Senator Sinema, and I yield back 1 minute and 21 seconds.

Senator SINEMA. Greatly appreciated there, Senator Wicker. Thank you so much. Now I will introduce our witnesses for today's hearing. Our first witness is Lisa Ellman.

Ms. Ellman is the Executive Director of the Commercial Drone Alliance and is a widely recognized authority on drone policy and law. Ms. Ellman, thank you for joining us today, and you are now recognized for your opening statement.

**STATEMENT OF LISA ELLMAN, EXECUTIVE DIRECTOR,  
COMMERCIAL DRONE ALLIANCE**

Ms. ELLMAN. Chairwoman Sinema, Ranking Member Cruz, and members of the subcommittee on Aviation Safety, Operations and Innovation, thank you for the opportunity to share my thoughts at this important hearing today on how we can promote aviation innovation safely for the benefit of the American public.

My name is Lisa Ellman, and I am the Executive Director of the Commercial Drone Alliance and a chair of the Uncrewed Aircraft Systems Practice at Hogan Lovells, at the global law firm of Hogan Lovells. I am honored to provide remarks on behalf of the CDA to inform your work on the upcoming FAA reauthorization.

The CDA is an independent, nonprofit organization made up of leaders in the commercial drone and advanced air mobility industries. We work with all levels of Government to collaborate on policies for safe and secure commercial drone integration. The commercial drone industry is delivering significant lifesaving societal and economic benefits for all Americans.

As just a few examples, drones are enhancing worker safety. In 2020, there were 54 accidents, resulting in 13 deaths in the aerial agricultural industry, including accidents in Texas, Colorado, Georgia, Illinois, Nevada, South Dakota, Missouri, and Kansas. Use of drones for these operations can prevent such fatalities.

Drones are promoting infrastructure resilience, providing early detection of oil and gas leaks, and inspecting our Nation's railways, bridges, and electrical grid. Drones are protecting the environment and enhancing sustainability, offering a substitute for ground vehicles and reducing carbon emissions associated with traditional inspection methods.

Drones are expanding access to medicines and critical supplies, and democratizing aviation by opening the industry to a broader

aviation workforce. Drones are enhancing public safety, fighting wildfires, and assisting with disaster response.

In Florida today, Florida Power and Light Company is deploying and flying drones in response to Hurricane Ian. Advancing this industry will ensure America's global competitiveness, our national security, and our leadership in global aviation, but these benefits will be fully realized only if Congress takes action.

Congress led the way in 2012 by mandating UAS integration. In the decades since, that mandate remains unfulfilled, and drones are often subject to application of incongruous regulations designed for crewed aircraft.

Despite the best efforts of the FAA's UAS Integration Office and other supporters, the FAA continues to view UAS integration as in its own words, a long road ahead and a significant challenge. Progress toward safe, scalable drone integration has been exceedingly slow, and America is falling behind other countries.

Bold and decisive Congressional leadership is necessary once again to spur progress for scalable UAS operations for the benefit of the American public. While there is much that can be done in the interim, the FAA reauthorization provides an excellent opportunity for Congress to demonstrate that leadership.

I have included many legislative proposals in our written testimony. I will highlight just a few of them here. First, Congress should reorganize the FAA to better align responsibility for UAS integration with authority over UAS approvals. The court challenges with UAS integration do not relate to safety.

Rather, they are process based, featuring a well-meaning Government bureaucracy designed for regulating crewed aviation, struggling to regulate an evolving environment. Common sense changes to the current organization would assist the agency to fulfill its mission safely and efficiently.

Second, Congress should promote UAS competitiveness by enabling safe, scaled, commercial drone operations in the United States, including by directing timely implementation of the beyond visual line of sight aviation rulemaking committee's excellent recommendations. Third, Congress should invest in the future.

Congress should support workforce development training for careers in drones, along with the use of drones to inspect local infrastructure, by enacting the DIG Act. We applaud Senators Blumenthal and Rosen for introducing this legislation, which recently passed the House.

Congress should also enable research and development by streamlining and improving approval processes. We include many more proposals and details within our written testimony, and I am happy to answer follow up questions. The opportunity cost of inaction continues to grow as the gap between technology and policy in the United States continues to widen.

Congress has the opportunity in the next FAA reauthorization to close this gap and bring the benefits of commercial drones to the American public. The Commercial Drone Alliance appreciates the opportunity to appear before you.

We look forward to continuing to collaborate with you to ensure America's global leadership in advanced aviation. Thank you.

[The prepared statement of Ms. Ellman follows:]

PREPARED STATEMENT OF LISA ELLMAN, EXECUTIVE DIRECTOR,  
COMMERCIAL DRONE ALLIANCE

Chairwoman Sinema, Ranking Member Cruz, and other members of the Subcommittee on Aviation Safety, Operations and Innovation:

Thank you for the opportunity to share my thoughts with you at this important hearing today on how we can promote aviation innovation safely, for the benefit of the American public. My name is Lisa Ellman, and I am the Executive Director of the Commercial Drone Alliance (CDA) and Chair of the Uncrewed Aircraft Systems (UAS, or Drone) Practice at the global law firm Hogan Lovells. I am honored to provide remarks on behalf of the CDA and help inform your work on the upcoming Federal Aviation Administration (FAA) Reauthorization and integrating new entrants into the National Airspace System (NAS).

The CDA is an independent non-profit organization made up of leaders in the commercial drone and advanced air mobility industries. Our Board is comprised of Wing, Skydio, Zipline, NUAIR, Choctaw Nation, Amazon Prime Air, Aloft, Percepto, SkySafe, DEDrone, Florida Power & Light, American Robotics, and Southern Company. The CDA works with all levels of government to collaborate on policies for industry growth and the safe and secure integration of UAS into the NAS. The CDA also seeks to educate the public on the safe and responsible use of commercial drones to achieve economic benefits and humanitarian gains.<sup>1</sup>

Commercial drones offer significant life-saving, economic and societal benefits—from creating jobs and enhancing worker safety, to protecting the environment and revolutionizing inspections of critical infrastructure, to expanding equitable and efficient access to medicines, to generating tremendous economic value and facilitating commercial deliveries, to enhancing public safety and fighting wildfires. Additional details about these benefits are included in Section IV below.

There are exciting efforts underway around the country to bring the benefits of UAS to the American people. For example:

- In Texas, BNSF Railway is working with Skydio to inspect our Nation’s railroads while Wing and Amazon Prime Air are bringing the benefits of commercial drone deliveries to the Dallas region and College Station community, respectively.
- In Arizona, the Navajo Nation is exploring using drones to deliver medicine and critical supplies to rural homes.
- In Kansas, the state Department of Transportation is working to demonstrate the capabilities of drones for infrastructure inspections and disaster response.
- The Choctaw Nation of Oklahoma is using drone technology to bridge the inequities between rural and urban communities, and is working with the University of North Texas to plan a next generation Advanced Regional Mobility Corridor to provide new opportunities and improve the quality of life for rural tribal communities.
- In New York, NUAIR is seeking to enable advanced research and development along a unique fifty mile corridor to enable our Nation’s continued leadership in aviation.

Although these and other efforts are promising, the vast benefits of UAS cannot yet be truly realized here in the United States. That is because regulatory paralysis and undue regulatory burdens have prevented scalable UAS operations and limited the integration of UAS into the NAS.

Congress led the way in 2012 with a legislative mandate for UAS integration. But in the decade since, that mandate has remained unfulfilled. Despite the best efforts of the FAA’s UAS Integration Office and other supporters, the FAA continues to view civil UAS integration into the NAS as, in its own words, a “long road ahead” and a “significant challenge.”<sup>2</sup> The National Academy of Sciences, the Department of Transportation’s Office of the Inspector General, and the Government Accountability Office have all criticized the FAA’s progress in UAS integration, describing

<sup>1</sup>The CDA brings together commercial drone end-users, manufacturers, service providers, advanced air mobility companies, drone security companies, and vertical markets including oil and gas, precision agriculture, construction, security, communications technology, infrastructure, newsgathering, filmmaking, and more. Learn more about the CDA at [www.commercialdronealliance.org](http://www.commercialdronealliance.org).

<sup>2</sup>FAA, Integration of Civil Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS) Roadmap, 3rd Edition (2020) at 4, 5.

it as “indefensible,”<sup>3</sup> and have highlighted how the UAS industry continues to be held back by the application of incongruous approaches designed for crewed aircraft.<sup>4</sup> This mismatch results in disjointed regulation that suppresses the industry’s progress by making it too slow and too difficult to secure the necessary approvals.

In the meantime, many countries around the world are progressing ahead of the United States in achieving scalable UAS operations and bringing the economic and societal benefits to their citizens and communities. As a result, the United States is at significant risk of losing its global leadership in this new era of aviation.

Bold and innovative congressional leadership is therefore necessary once again to spur progress for scalable UAS operations and their integration into the NAS for the benefit of the American public. While there is much that can be done in the interim to advance policy and enable scaled commercial operations, the FAA Reauthorization provides an excellent opportunity for Congress to demonstrate that leadership. The CDA urges the Congress to take decisive action to drive the full integration of commercial drones into the NAS. Congress should not allow the budding American UAS industry to continue languishing in a regulatory limbo that prevents the industry from scaling and deprives our country of massive economic and societal benefits.

### I. THE NEED FOR DECISIVE CONGRESSIONAL ACTION

The use of zero-emission UAS to save lives, provide rural medical access, and maintain our Nation’s aging infrastructure has been a bipartisan policy priority since 2012. Policy has lagged behind technology, and integration efforts have lagged behind the pace of innovation in America. For example, drone operations continue to be almost exclusively limited to line of sight, meaning that drone operators must follow every drone flight with a human on the ground watching the aircraft at all times. Approvals to fly beyond visual line of sight (BVLOS) are limited and rare. Just as crewed aviation operations would be hamstrung if airplanes were unable to leave sight of the control tower, such restrictions severely limit the utility of UAS. Notwithstanding the valiant efforts of certain staff at the FAA, progress toward safe and scalable UAS operations integrated into the NAS has been slow and halting, and America is being left behind.

Congressional action is necessary to secure U.S. leadership in a new era of aviation. The United States dominated the first century of flight, from Kitty Hawk to the Moon and beyond, to the great benefit of our society and economy. But U.S. leadership in the second century of flight—defined not by crewed operations, but by uncrewed and, increasingly, autonomy-enabled operations—is in jeopardy. Other nations are working hard to establish leading roles in a new era of flight. Democratic peer nations—such as Australia, Canada, Japan, the United Kingdom and the European Union—have taken significant steps to enable advanced drone operations and capture the societal and national security benefits associated with aviation leadership. Many U.S. companies have invested heavily to pursue opportunities in those markets, even if they would prefer to invest here at home. This trend will only accelerate so long as there remains skepticism regarding the U.S. Government’s ability to deliver on its promise to integrate UAS into the NAS and enable scalable UAS operations. At the same time, competitors like China have invested extraordinary resources in an attempt to surpass the United States.

The White House has recognized the benefits of UAS, as evidenced by its August 2022 Summit on advanced air mobility. While that attention is welcomed, Congress needs to ensure that it translates to concrete action. Without strong and timely con-

<sup>3</sup>National Academies of Sciences, Engineering, and Medicine, 2018. *Assessing the Risks of Integrating Unmanned Aircraft Systems (UAS) into the National Airspace System*. Washington, DC: The National Academies Press. Found at <https://doi.org/10.17226/25143>; GAO, *FAA Could Strengthen Its Implementation of a Drone Traffic Management System by Improving Communication and Measuring Performance* (2021); DOT OIG, *Opportunities Exist for FAA To Strengthen Its Review and Oversight Processes for Unmanned Aircraft System Waivers* (2018). See also Letter from Chair of House Committee on Transportation and Infrastructure Peter DeFazio (D-OR), Ranking Member Sam Graves (R-MO), Chair of the Subcommittee on Aviation Rick Larsen (D-WA), and Subcommittee Ranking Member Garret Graves (R-LA) to Comptroller General Gene Dodaro, Feb. 24, 2021 (noting concern that “[T]he FAA faces a range of challenges to successful and timely integration”) (found at <https://transportation.house.gov/news/press-releases/committee-leaders-call-on-gao-to-review-status-of-faas-efforts-to-integrate-drones-into-the-nations-airspace>).

<sup>4</sup>As the GAO noted, one test site’s waiver request took three years for the FAA to approve. See GAO, *FAA Could Better Leverage Test Site Program to Advance Drone Integration* (2020) at 24. Similarly, it took one CDA member company five years of sustained R&D and interactions with the FAA to receive an experimental approval to operate on three rural sites. From the time of formal application, it took two years to receive this limited approval.

gressional action, U.S. leadership in aviation hangs in the balance, as does the future of the commercial drone industry.

## II. SUMMARY OF CDA PRIORITIES FOR THE 2023 FAA REAUTHORIZATION

The CDA firmly believes that Congress can help ensure American leadership in the next century of aviation, relieve the regulatory paralysis and undue burdens that have so far constrained UAS operations in the United States, and reinvigorate efforts toward scalable UAS operations and integration into the NAS. To achieve those objectives, the CDA strongly urges Congress to take the following decisive actions as part of the 2023 FAA Reauthorization.

- A. *Policy and Resourcing.* Congress should reorganize the FAA to better align responsibility for UAS integration with authority over UAS approvals, which is a critical weakness in the FAA's current UAS framework. In addition, Congress should require the FAA to consider the positive aggregate safety gains and environmental impact of UAS use, as compared to other transportation options, in conducting safety and environmental analyses.
- B. *Enabling Expanded UAS Operations and Promoting Safety and U.S. Competitiveness.* Congress should direct the FAA to issue a notice of proposed rulemaking enabling BVLOS operations in alignment with the recommendations of the BVLOS Aviation Rulemaking Committee (BVLOS ARC) within 180 days of enactment.
- C. *Helping America Win the 21st Century by Enabling Research and Development at Home.* Congress should streamline research and development processes to enable test sites and public-private partnerships to move UAS integration forward and promote U.S. leadership in aviation.
- D. *Supporting UAS Manufacturing Capabilities and the Supply Chain System.* Congress should take action to support the growth of UAS/AAM manufacturing in the United States. Among other measures, Congress should enhance and expand the successful Blue UAS program, and require a report on the extent to which DOD and other agencies can replicate the Army's experience of rapidly procuring UAS systems in large numbers. The best way to ensure U.S. leadership in the second century of aviation is to build the future in the United States, creating domestic jobs and boosting U.S. competitiveness.
- E. *Delivering on Infrastructure Investment.* Congress should promote infrastructure resilience, including by appropriating funds to the FAA and by requiring the DOT and the FAA to promote the use of drones for infrastructure applications, as well as working with state, local, and tribal governments to advance infrastructure inspection operations applications at scale. In particular, Congress should enact the DIIG Act, which recently passed the House. We applaud Senators Rosen, Blumenthal, and Bozeman for introducing the DIIG Act in the Senate and urge its swift passage.

## III. DISCUSSION OF SPECIFIC CDA PROPOSALS

### A. Policy And Resourcing

*Aligning UAS Responsibilities and Authorities.* Congress should reorganize the FAA to better align responsibility for UAS integration with authority over UAS approvals, which is a critical weakness in the FAA's current UAS framework. Today, the FAA's UAS Integration Office has no authority to actually integrate UAS. Instead, responsibility for UAS integration is diffused and splintered across many different offices, each with its own existing set of traditional aviation responsibilities and mandates. To address this systematic misalignment, Congress should:

- Create a position of Associate Administrator to oversee UAS integration and thereby empower the FAA's UAS Integration Office with the resources and authorities to fulfill the mandate of UAS integration into the NAS. This office should have the dual mandate of ensuring the safe integration of UAS into the NAS and encouraging and promoting a commercially viable UAS industry and American leadership in UAS.
- Provide the Associate Administrator with the authority to approve UAS rulemaking, certification and operational approvals for specific categories of UAS that:
  - Have 25k ft/lbs. or less of transferred kinetic energy, consistent with the recommendations of the BVLOS ARC, and
  - Operate at an altitude of 400 feet above ground level (AGL) or less and at least three miles from airports.

- Require the FAA to consider the positive aggregate safety gains and environmental impact of UAS use on other modes of transportation and methods of inspection/operation in conducting safety and environmental analyses.

*Enabling Expanded UAS Operations And Promoting Safety And U.S. Competitiveness*

*Implement BVLOS Rulemaking Expeditiously.* Broadly enabling UAS flights BVLOS in a safe and secure manner is critical to unlocking the aggregate safety, security, equity, and sustainability benefits of using drones for many commercial and public safety tasks. Congress should direct the FAA to issue a notice of proposed rulemaking enabling BVLOS operations in alignment with the recommendations of the BVLOS ARC within 180 days of enactment. In accordance with BVLOS ARC recommendations, Congress should include language in the 2023 FAA Reauthorization that:

- *Adopts an Acceptable Level of Risk:* Require the FAA to adopt a quantified acceptable level of risk for UAS operations that is modeled upon and consistent with existing accepted general aviation risks.
- *Encourages and Incentivizes Equipage:* Encourage and incentivize the very small number of crewed aircraft that routinely operate below 500 feet AGL to equip with Automatic Dependent Surveillance-Broadcast (ADS-B) or TABS technology to provide conspicuity, enhance the overall safety of the NAS, and ensure that UAS can avoid them;
- *Enables New Technology Solutions:* Direct the FAA to explore the authorization and use of non-technical standard order (TSO) devices where risk analysis deems them to be sufficient, such as for installation and use in non-certified aircraft.
- *Establishes a Risk-Based Framework for UAS Airworthiness:* Direct the FAA to adopt industry-based standardized airworthiness compliance standards, modeled after the FAA's light-sport aircraft certification process, to provide manufacturers with clear guidance on how to obtain FAA airworthiness approval. Consistent with the recommendations of the BVLOS ARC, compliance should be declared by U.S. manufacturers, with the FAA retaining ultimate oversight over the safety of each submission. In addition, Congress should require the FAA to work with the European Union Aviation Safety Agency (EASA) to harmonize UAS/Vertical Take-Off and Landing (VTOL) aircraft certification criteria and report back to Congress on progress.
- *Implement Tailored and Risk-Appropriate Qualification Criteria for UAS Pilots and Certificated Operators:* Require the FAA to enact streamlined, risk-appropriate certification criteria tailored specifically for commercial drone operators and air carriers. These criteria should recognize the substantial improvements in automation, safety and risk-reduction of drone operations when compared to traditional aviation. For UAS BVLOS pilots, direct the FAA to create and implement knowledge-based crew qualification/training standards to add a BVLOS rating for UAS pilots.
- *Enables Shielded Operations:* Direct FAA to immediately implement BVLOS ARC recommendations that do not require rulemaking, including enabling low-altitude "shielded" operations that permit drones to fly above and within very close proximity to structures and terrain where crewed aircraft are unlikely to operate. Shielded operations provide high levels of value—enabling more efficient inspection of critical infrastructure like long linear infrastructure and power plants, in addition to public safety missions such as search and rescue—with low levels of risk, given the low altitude and close proximity to structures and the ground. Other countries, including the European Union and Australia, have already established frameworks to enable shielded operations at scale. Congress should direct the FAA to issue guidance, such as standard scenarios or pre-defined risk assessments common with other civil aviation authorities, providing accelerated pathways to enable low-altitude operations under the current rules, within 90 days of enactment. That guidance can and should be issued before a rulemaking on BVLOS is issued, as noted by the BVLOS ARC.
- *Advances Network Remote Identification:* Require that the FAA accept internet-based network identification as an acceptable means of compliance with rules requiring UAS to be equipped with technology to allow for remote identification.

*Improve the Airworthiness Process for UAS.* Congress should direct the DOT and the FAA to improve and expedite the airworthiness approval process for UAS technologies. For several years, the FAA has tried and failed to adapt the existing and burdensome airworthiness process to UAS. The FAA recently issued a UAS stand-

ard airworthiness certificate to Matternet, and that was a positive step forward.<sup>5</sup> Now that the FAA has done this successfully once, the agency should expeditiously process additional approvals, and incorporate lessons learned and streamline and improve the process for the agency and the broader industry. UAS are the safest form of aviation today in terms of serious injuries or fatalities. Improving these critical processes will promote UAS innovation while ensuring that technological, safety and security advances are implemented efficiently. Congress should also provide adequate resources to implement advanced aviation certification programs. In particular, Congress should provide additional funding for FAA’s “Operations” appropriation, specifically designated for the Aircraft Certification Service’s review and certification of UAS.

To facilitate the timely issuance of airworthiness approvals for small UAS in the near-term, Congress should exempt low-risk small UAS from noise certification requirements. Under the current regulatory process, the FAA may only issue an original type certificate for an aircraft after the FAA determines that the aircraft meets prescribed noise standards. There are no prescribed noise standards for small UAS, which means the FAA needs to undertake a lengthy (years-long) and resource-intensive rulemaking process for every individual small UAS going through the type certification process to establish custom noise standards on a case-by-case basis. Rather than requiring the FAA to establish unique noise standards for every single different type of small UAS going through the certification process, Congress should direct the FAA to gather data necessary to establish generally applicable noise standards for small UAS. This represents a straight-forward and immediate opportunity to streamline and modernize our regulatory system in a manner that can yield significant short-term gains for society. For the longer term, Congress should require the FAA to implement the recommendations of the BVLOS ARC.

*Reauthorize and Expand Section 44807.* To cover the near-term gap between current authorizations and a streamlined airworthiness approval process, Congress should immediately extend the timeline for Section 44807 authorities. Such an effort would be even more impactful if Congress opted to also expand and re-imagine this authority. In particular, the FAA has interpreted Section 44807 very narrowly, contrary to Congress’s original intent to provide a pathway to enable advanced operations that can be conducted safely, even when those operations do not fit neatly within an existing rule. By reinforcing the original intent to implement this rule, Congress will provide a pathway to advance innovation while ensuring safety and address those interpretations that have to date substantially limited the utility of this provision. Finally, until the FAA publishes a BVLOS rule, Congress should require the FAA to a) develop and publish within 180 days of enactment clear guidelines for commercial BVLOS operations and b) to use the 44807 special authority to enable such operations.

*Support UAS Traffic Management and LAANC Modernization.* Congress has recognized the importance of Uncrewed Traffic Management (UTM), including most recently in Section 342 of the 2018 FAA Modernization Act. UTM is important for the safe and secure expansion of UAS operations and integration of UAS into the NAS—both of which are congressional objectives. Without UTM, the countless benefits of expanded, scalable, and complex UAS operations (e.g., long-range BVLOS flights to deliver packages and medical supplies) for Americans and American businesses may be more difficult to reach. As a precursor to a UTM system, Congress should direct the FAA to permit approved UAS Service Suppliers (USSs) to utilize application program interfaces (APIs) and deep linking with the software products of third parties. This modernization of the Low Altitude Authorization and Notification Capability (LAANC) system will enhance safety by increasing compliance among airspace users, and avoid a chilling effect on innovation in the U.S.

*Enable Expanded Use of Drones for First Responders.* Congress should direct the FAA to establish a streamlined approval process for “Public Safety Drone as a First Responder” BVLOS Waivers. Such waivers allow public safety agencies and First Responders to have “eyes on the scene” in a timely manner when emergency strikes. For this reason, drones serve as one of the best de-escalation tools for police departments and have been demonstrated to save lives and protect both First Responders and the public.

*Promote Pathways for Increasingly Automated and Autonomous Operations Safely.* Maintaining U.S. global leadership in aviation hinges on our collective ability to design and deploy safe, effective automated and autonomous systems in a way that protects the safety of the NAS. In order to lead the way, the U.S. must create streamlined pathways for increasingly autonomous operations—first for smaller

<sup>5</sup> <https://www.prnewswire.com/news-releases/matternet-m2-drone-delivery-system-first-to-achieve-faa-type-certification-301619827.html>.

drones inspecting infrastructure or delivering packages in relatively close proximity to the ground, and then for larger vehicles delivering cargo and transporting people at higher altitudes and over greater distances. To achieve that objective, Congress should direct the DOT and the FAA to develop and report to Congress within 270 days of enactment on pathways to enable UAS and advanced air mobility (AAM) operations with increasing levels of automation. As discussed below, Congress should also codify and expand the FAA's BEYOND program, tasking it to test safe and scalable frameworks for automated and ultimately autonomous operations, among other forms of operations.

*Modernize the DOT Hazardous Materials Framework.* The existing DOT hazardous materials (HAZMAT) framework was designed for large, crewed, commercial operations at high altitudes. Congress should direct the DOT to modernize the existing framework by promulgating rules tailored to the movement of HAZMAT by UAS. These regulations should be more aligned with the HAZMAT regulations for ground transportation than those for air transportation given UAS delivery will occur at low altitudes.

*Streamline Operational Approval Processes.* As described below, UAS can offer environmental benefits and emissions reductions far beyond any other transportation mode yet developed. Unfortunately, to date, environmental review processes related to UAS have lacked resourcing and regulatory clarity, hindering industry's ability to scale and, paradoxically, impeding the realization of environmental benefits. To aid the scaling of new technologies, Congress should direct the FAA to develop National Environmental Policy Act (NEPA) Implementation Procedures for UAS operational approvals, including programmatic approaches to enable scaled operations where operating parameters are similar. Clear, right-sized procedures will help both communities and operators assess the potential environmental resource impacts within different operating contexts (whether a limited scale operation within a small community or a broader network of drone delivery or other AAM services across a region or operations over industrial sites closed to the public with high levels of ambient noise). Congress should also consider what additional staffing and/or resources are needed to move processes forward in a streamlined way.

*Modernize DOT Economic Authority Requirements.* Congress should reform aviation citizenship laws applicable to UAS operators to minimize barriers to entry and promote investment in U.S. companies. Laws defining aviation citizenship were defined for a different industry and different era. Due to how aviation citizenship laws are currently drafted, certain BVLOS operators (air carriers) will require "economic" authority from the DOT to operate, including a requirement that the operator meet a narrowly tailored definition of "citizen of the United States." Foreign civil aircraft operators conducting operations other than air carrier operations in the U.S. will also need DOT authorization. The application of these aviation citizenship laws to the UAS industry often leads to absurd results where American companies are not able to prove U.S. citizenship. Aviation citizenship laws should be updated to facilitate, rather than hinder, this emerging industry in the modern era.

#### *C. Helping America Win The 21st Century By Enabling Research And Development At Home*

*Empowering UAS Test Sites to Promote R&D.* UAS R&D activities help support the safe and efficient integration of UAS into the NAS. However, current R&D processes do not enable broad testing in the U.S. in a timely way. The FAA-designated UAS Test Sites were established for the purpose of facilitating valuable UAS R&D necessary to fully integrate UAS into the NAS, but achieving this objective has been limited by a recent change in the FAA's interpretation of R&D activities that qualify for public aircraft operation (PAO) status. While FAA-designated UAS Test Sites are most acutely affected by this change in the ability to conduct UAS research and development as PAO, the change also affects other public entities, including, but not limited to, public agencies and public universities that conduct crucial UAS research and development activities. To assist the FAA in carrying out the objectives of the UAS Test Site program, Congress should clarify that UAS operated for R&D purposes at UAS Test Sites meet the definition of "public aircraft" in 49 U.S.C. §40102(a)(41) and qualify for PAO status under 49 U.S.C. §40125. Additionally, Congress should direct the FAA to encourage the continued use and expansion of technology innovation zones and support communities that are eager to embrace new technologies such as UAS. Congress also should renew or extend the test site mandate from the FAA Modernization and Reform Act of 2012. And Congress should request a timeline for immediate implementation of 49 U.S.C. §44803.

*Leveraging Public-Private Partnerships to Accelerate Advanced Operations.* The CDA supports strong Federal preemption to enhance safety and avoid a patchwork quilt of regulations. However, the CDA also believes that states, localities and tribes

play an important role in the UAS ecosystem. CDA therefore urges Congress to leverage and expand existing public-private partnerships to advance safe and effective advanced drone operations. In order to remain competitive in a tight global marketplace, the U.S. must have accelerated pathways to conduct advanced operations. The BEYOND program, and the Integration Pilot Program (IPP) before it, were designed to play that critical role. Congress earlier codified and funded the IPP. In the next FAA Reauthorization, Congress should rebrand, codify, and expand the BEYOND program for five years to include the full spectrum of uncrewed aircraft. This expanded program could include collecting data that would accelerate rulemakings, developing model policy, and requiring regulatory enabling actions to flow from these partnerships. Congress can bring together UAS Test Sites and BEYOND sites under a common umbrella to support safe scaling of emerging aviation technologies. In addition to enabling the FAA and industry to conduct and learn from advanced operations in the real world, the program enables state, local, Tribal, and territorial governments to play an important role, working in partnership with the Federal government and industry to use technology to solve pressing local needs. In its next iteration, the re-imagined BEYOND program should focus on the central challenge confronting the U.S. and the industry: enabling and refining operational and regulatory constructs for highly automated and autonomous UAS operations.

#### *D. Supporting UAS Manufacturing Capabilities And The Supply Chain System*

Congress should take action to support the growth of UAS/AAM manufacturing in the United States. The best way to ensure U.S. leadership in the second century of aviation is to build the future in the United States, creating domestic jobs and boosting U.S. competitiveness. Among other measures, Congress should enhance and expand the successful Blue UAS program.

*Enhance and Expand the Blue UAS Program.* The conflict in Ukraine has demonstrated the strategic national security importance of small civilian drone technology. In the U.S., the Defense Innovation Unit's Blue UAS program has been a valuable tool designed to identify, test, and publish a consolidated list of UAS suitable for use by the Department of Defense. Given the importance of supporting the growth of a strong and competitive domestic manufacturing base, and the Congressional requirements outlined in Section 848 of the FY20 NDAA, the Blue UAS list must remain current, relevant, and inclusive. The Blue UAS list provides a platform on which to expand the use of drone technology by the Federal government.

The Army's Short Range Reconnaissance (SRR) program helped to generate the initial Blue UAS list. The SRR program provides a model of efficient and dynamic procurement and demonstrates how the list can benefit government end users and industry alike. In its first tranche, the SRR program identified and procured a Blue UAS system UAS using Other Transaction Authority, rapidly transitioning a capability from the prototype phase to program of record in a short period of time. That is a model other military services and other Federal departments could follow when procuring small UAS (and larger UAS and AAM systems). Congress should commend the work of the Blue UAS program and encourage continued evaluation of UAS for inclusion on the Blue UAS list. Further, Congress should require a report on the extent to which DOD and other agencies can work together to expand the Blue UAS program and replicate the Army's experience of rapidly procuring UAS systems in large numbers—providing the government with a critical tool on a rapid timetable while creating domestic jobs and boosting U.S. competitiveness. In addition to supporting the Blue UAS program, Congress should consider additional measures to support domestic drone manufacturing in a market historically dominated by companies based in countries of concern.

#### *E. Delivering On Infrastructure Investment*

*Promoting Infrastructure Resilience.* With the passage of the Infrastructure Investment and Jobs Act (IIJA), Congress provided \$550 billion in new funding to address infrastructure needs across the country, including \$40 billion over five years to repair, replace, and rehabilitate our crumbling bridges. Inspections of our aging infrastructure are key to successful implementation of the investments Congress has already made. Drones can play a critical role in ensuring safe, accurate inspections are carried out to ensure responsible use of taxpayer dollars. The use of drones for infrastructure inspections has several benefits when compared to traditional inspection protocol. Drones are easier and safer to operate—protecting workers from large equipment and from entering dangerous areas when inspecting assets. Moreover, drones can capture automated data and aerial insights, and stakeholders can perform inspections more regularly, quickly, and efficiently, which increases the safety of our infrastructure and supports higher levels of worker safety. Given the major influx of Federal dollars for investment in our crumbling infrastructure, the FAA

and the DOT should work expeditiously to ensure the use of drones to increase the efficiency of those investments. To capture and expand on these benefits, Congress should include language within the 2023 FAA Reauthorization appropriating \$5 million to the FAA and requiring the DOT and the FAA to promote the use of drones for infrastructure applications and work with state, local, and tribal governments—as well as private sector critical infrastructure and utility stakeholders—to advance infrastructure inspection operations applications at scale. Congress should also direct the FAA to encourage interagency collaboration to promote the use of drones for infrastructure inspections across all modes of transportation.

*Enacting the Bipartisan Drone Infrastructure Inspection Grant (DIIG) Act, H.R. 5315.* To the extent the bipartisan DIIG Act, which was recently passed by the U.S. House of Representatives (and was introduced in the Senate last month by Senators Rosen, Blumenthal, and Bozeman), is not enacted in 2022, we encourage Congress to ensure this critical program is enacted in the 2023 FAA Reauthorization. This Program would have two fundamental pillars, each administered by the DOT:

- (1) \$100 million to enable States, cities, and tribal governments to inspect America’s aging infrastructure with drone technology (including by funding program management capacity or drones), thereby making workers safer, inspections more efficient, and infrastructure more resilient, while supporting high-paying jobs in inspection and U.S. drone manufacturing; and
- (2) \$100 million for grants to community colleges and universities to train new and existing workers on drone technology and to prepare them for careers in aviation and STEAM, building on unfunded programs established in the 2018 FAA Reauthorization Act.

*Providing Necessary Congressional Oversight.* The Congress should also require that the FAA follow through on previous legislative directives which remain unfulfilled. For example, the FAA Extension, Safety, and Security Act of 2016 required the FAA to designate fixed site facilities to promote security and innovation; several deadlines have come and gone, and six years later Section 2209 has not yet been implemented. As another example, the FAA Reauthorization Act of 2018 (at 49 USC § 44803) required the FAA to issue broad waivers to designated FAA UAS Test Sites in a streamlined way; as research and development efforts struggle to take off in the U.S. due to regulatory barriers, the FAA has simply failed to implement this important initiative. These are just a few examples of regulatory failures that merit appropriate scrutiny to ensure the intent of Congress is implemented. Accordingly, the CDA urges Congress to exercise its essential oversight function to require relevant agencies to defend their continued inaction to implement previous congressional mandates and request a timeline from the FAA for immediate implementation of these provisions.

#### **IV. EXPANDING AND ENABLING THE UAS INDUSTRY UNLOCKS SIGNIFICANT BENEFITS FOR ALL AMERICANS**

The UAS industry can deliver significant societal and economic benefits for all Americans, but only if Congress takes action needed to overcome regulatory and policy hurdles that prevent scalable commercial drone operations in the United States. A few examples of these significant benefits will demonstrate why enabling UAS operations and eliminating regulatory paralysis and undue burdens is so critically important.

*Boosting Safety for Workers and the Public.* A major benefit of UAS is the immediate and aggregate safety enhancement that can be achieved in comparison to the traditional alternatives. For example, tower inspections traditionally have subjected workers to the hazards and risks of climbing a tower (with an average height across the country of about 280 feet). UAS operations, by contrast, can allow the inspector to remain on the ground, improving worker safety and reducing injury and death. Similarly, many types of safety inspections require crewed helicopters that involve extra risk, in addition to serious environmental consequences.<sup>6</sup> UAS operations can reduce helicopter flight hours by 44,000 hours per year, which can statistically eliminate 1.6 helicopter accidents.<sup>7</sup> Another sobering example of the potential for

<sup>6</sup><https://rotormedia.com/unmanned-systems-save-lives-in-high-risk-manned-operations/>. See “Identifying How UAS OPA Can Reduce Fatal Accidents in High Risk Manned Helicopter Operations” prepared by Mark Colborn, Scott Burgess, Ph.D., and Wayne M. Keeton—H–SE 90 SME Team, United States Helicopter Safety Team (USHST), Feb. 2, 2019.

<sup>7</sup>Levitape Capital White Paper, Enterprise Market 2020, at 19, available at <https://levitapecap.com/levitape/wp-content/uploads/2020/12/Levitape-Capital-White-Paper.pdf>.

UAS to save lives is the aerial agricultural industry. Analysis of National Transportation Safety Board (NTSB) reports shows that, in 2020 alone, there were 54 aircraft accidents involving agricultural operations, including 12 fatal accidents resulting in 13 deaths.<sup>8</sup> The use of UAS to perform these potentially hazardous aircraft operations will significantly reduce the number of pilot fatalities that occur each year in the aerial agricultural industry. On the ground, expanded UAS delivery operations can lead to 1.5 billion fewer road mile deliveries by freight in 2025, and 29 billion fewer road miles by 2030, reducing road accidents.<sup>9</sup> Modeling by Virginia Tech suggests that at scale, UAS delivery could help to avoid 580 road accidents per year in a single U.S. city such as Austin, TX, or Columbus, OH.<sup>10</sup> Furthermore, due to their ease of use compared with traditional means of inspection, UAS can significantly increase the frequency and depth of inspections, boosting and aggregating the total benefits to safety.

*Supporting the Economy and Putting Americans Back to Work.* If the regulatory framework can keep pace with this rapidly evolving industry, UAS will unlock billions of dollars in economic growth over the next few years. There are many varying estimates of market potential, but the numbers are all large. The size of the commercial drone market—the fastest growing segment—is expected to reach \$16 billion by 2025 and \$29 billion by 2030.<sup>11</sup> Those figures represent only baseline estimates; other figures estimate a market size of \$21 billion and \$36 billion by 2025 and 2030, respectively. There also is significant potential for broad economic savings as a result of enterprise UAS operations. For example, the U.S. economy could save up to \$920 million annually using drones to inspect energy utility infrastructure.<sup>12</sup> Economic benefits also can flow to local small businesses participating in UAS delivery programs. One study of UAS local delivery programs found that local participating retailers could each experience more than \$200,000 a year in increased business opportunities, and local restaurants could generate up to \$284,000 in additional sales, by expanding the footprint of serviceable customers.<sup>13</sup>

Relatedly, to ensure adequate food supply and equitable food prices for Americans, drones can enable the next generation of precision agriculture. With fewer entrants into the agricultural labor force each year, the agriculture industry is looking to increase its use of technology and automation to keep pace with a growing population's demand for food. There are over 900 million acres of farmland in the United States, and UAS operation is the most efficient way to routinely monitor this land.

*Enhancing Sustainability.* Promoting innovative aviation technologies such as UAS furthers sustainability and environmental priorities. A wide variety of industries are counting on UAS to help decarbonize their operations, particularly those that currently rely on larger, louder gas-powered vehicles (whether aerial or surface-based) to inspect infrastructure or deliver goods or services.

Existing commercial drone deployments have already demonstrated a net positive impact on the environment—including reductions in overall noise levels and CO<sub>2</sub> greenhouse gas emissions. For example, two 2021 studies found that drone-based delivery reduced delivery carbon emissions and energy usage by 96–98 percent compared to cars, a significantly larger reduction than switching to EVs.<sup>14</sup> The Virginia Tech Drone Delivery Study indicated that enabling drone delivery in a single U.S. metropolitan area could avoid up to 294 million miles per year in road use; that is equivalent to taking 25,000 cars off the road, and reducing carbon emissions by up to 113,900 tons per year. This reduction of carbon emissions is the equivalent of planting 46,000 acres per year of new forest.

The use of UAS as a substitute for ground vehicle trips leads to a sustainability impact orders of magnitude greater than what can be achieved through any other method. Light electric drones generate only 2–3 percent of the carbon emissions compared to an electric vehicle, meaning that substituting UAS trips for ground ve-

<sup>8</sup> <https://agairupdate.com/2021/02/23/ntsb-final-report-2020/>. Among other state data, the report included documentation of three accidents each in Texas and Colorado, two accidents in Georgia, and one accident in Illinois, Nevada, South Dakota, Missouri and Kansas.

<sup>9</sup> Levitate Capital White Paper, Enterprise Market 2020 at 19.

<sup>10</sup> <https://wing.com/resource-hub/articles/why-do-we-need-drone-delivery/>.

<sup>11</sup> Levitate Capital White Paper, Enterprise Market 2020 at 28.

<sup>12</sup> Levitate Capital White Paper, Enterprise Market 2020, at 6.

<sup>13</sup> Sarah Lyon-Hill, et. al., *Measuring the Effects of Drone Delivery in the United States*, Virginia Tech Office of Economic Development and the Grado Department of Industrial & Systems Engineering (Sept. 2020), [https://www.newswise.com/pdf\\_docs/160018187481745\\_Virginia%20Tech%20Measuring%20the%20Effects%20of%20Drone%20Delivery%20in%20the%20United%20States\\_September%202020.pdf](https://www.newswise.com/pdf_docs/160018187481745_Virginia%20Tech%20Measuring%20the%20Effects%20of%20Drone%20Delivery%20in%20the%20United%20States_September%202020.pdf) (hereafter, Virginia Tech Drone Delivery Study).

<sup>14</sup> Rodrigues et al, “Drone flight data reveal energy and greenhouse gas emissions savings for small package delivery” (Cornell Univ. arXiv.org, Nov. 2021); Zipline, “A First-Ever Look at the Sustainability of Autonomous Aerial Logistics” (Zipline Blog, Nov. 2021).

hicle trips has an unrivaled decarbonization impact. In particular, UAS often substitute for the least efficient and most carbon-intensive transportation tasks. For example, state departments of transportation have begun to use drones to inspect bridges. In some cases, inspection crews can use electric drones instead of sending large semi-trucks known as snooper trucks, which often have a gas mileage lower than 5 mpg.<sup>15</sup>

Additionally, UAS play a key role in supporting and encouraging the transition from fossil fuels to renewable energy. UAS enable increased efficiencies in both the construction and operation phases of renewable energy plants—such as solar, wind, nuclear, and hydro. In short, UAS make renewable energy projects more economically viable and cost-effective by facilitating less-costly inspections of such infrastructure.

Commercial UAS also are used to reduce GHG emissions in the oil & gas industry through early detection of loss of containment (*e.g.*, oil leaks) and fugitive emissions (*e.g.*, methane gas leaks). UAS also reduce the carbon footprint associated with in-field time dedicated to historical monitoring, inspection and maintenance operations in industrial markets. There are over 900,000 well pads and 500,000 miles of pipeline in the United States. Every inch of those assets needs to be continually monitored for defects and leaks to properly assure safety and reduce GHG emissions.

Industries are counting on UAS to help decarbonize their operations, and integrating UAS into the supply chain and the American economy can play a central role in helping achieve climate and sustainability goals.

*Promoting Equity.* Supporting the UAS industry provides Congress with a unique opportunity to advance equity initiatives and ensure expanded access for underserved or remote communities. Drones have the potential to play a key role in delivering essential goods and medical supplies to difficult-to-reach populations<sup>16</sup> and to vulnerable populations that are mobility challenged or lack access to a vehicle.<sup>17</sup> For example, an American company recently received the State Department’s Award for Corporate Excellence for using drones to provide COVID–19 vaccines to rural and remote communities in foreign countries.<sup>18</sup> There is no reason such benefits cannot be brought to American communities as well. An appropriately tailored regulatory framework would enable the delivery of medical, lifesaving and other critical supplies to remote, rural and tribal areas, and the millions of Americans living in so-called “pharmacy deserts” or struggling to get health care in the face of mounting rural hospital closures. Similarly, use of UAS to inspect critical infrastructure across the country offers economically hard-hit localities with limited budgets the opportunity to enhance safety at a fraction of the cost.

Drones also democratize aviation, providing a gateway to aviation in a manner far less expensive and far easier to access than traditional aviation, which has high barriers in the form of aircraft rentals, traditional pilot certification, and access to airports. Drones are helping to inspire a new and more diverse generation of Americans to study STEM and embark on careers that span the spectrum in aviation, from engineering and design, to maintenance and operations.

*Promoting Infrastructure Resilience.* As our country makes massive investments in infrastructure, UAS can play a critical role in making those investments go farther. In terms of scale, the current number one commercial use case for UAS is the inspection of critical infrastructure. UAS promote infrastructure resilience by enabling unprecedented awareness of infrastructure health, including the creation of digital twins to track changes and damage over time. Due to their ease of use compared with traditional means of inspection, UAS can significantly increase the frequency and efficiency inspections—helping to preserve existing infrastructure and expedite construction times on new infrastructure. For example, drones help to re-

<sup>15</sup>Last year, for example, North Carolina DOT and CDA member Skydio worked together to secure a first-of-a-kind statewide waiver from the FAA enabling the use of drones BVLOS to inspect bridges. See <https://www.ncdot.gov/news/press-releases/Pages/2020/2020-10-05-drone-bridge-inspection-waiver.aspx>. If North Carolina DOT could use drones to inspect 5,000 of its approximately 14,000 bridges, the environmental impact would be equivalent to taking 1,000 cars off the road. See also Brendan Groves, How Drones Can Unlock Greener Infrastructure Inspection, World Economic Forum, August 10, 2021, <https://www.weforum.org/agenda/2021/08/how-drones-unlock-greener-infrastructure-inspection/>.

<sup>16</sup>Recently, Ghana began using drones to provide COVID–19 vaccine delivery to rural hospitals nationwide, ensuring that rural doctors and nurses have equal access to these lifesaving vaccines as their urban counterparts. See <https://www.gavi.org/vaccineswork/covax-vaccines-take-air-drone>.

<sup>17</sup>Virginia Tech Drone Delivery Study, at vi (noting that drone delivery could benefit up to 66,000 people in a single metropolitan area who lack access to a vehicle).

<sup>18</sup>U.S. Department of State, *Secretary of State’s Award for Corporate Excellence—United States Department of State* (2021).

duce the odds of a train derailment and increase the uptime of train systems across the Nation’s 140,000 miles of rail track.<sup>19</sup>

*Ensuring Global Competitiveness.* American competitiveness in the global economy and U.S. leadership in global aviation is at risk due to a lack of regulatory certainty and risk-appropriate oversight for UAS. Global competitors—including countries like China—are determined to win the next century of aviation and capture the jobs and societal benefits that accompanied America’s leadership in the first century of flight. Due in part to the regulatory barriers here in the U.S. and Chinese-state subsidized companies, roughly 70–90 percent of the drone market is controlled by non-U.S. companies. The Civil Aviation Administration of China has just published a detailed plan outlining how China will enable the use of drones for use cases such as inner-city logistics and long-haul goods transport to be a “global civil aviation power.”<sup>20</sup> The plan also buttresses China’s continued commitment to lead the world in the development of small drones for inspection and situational awareness—a sector in which Chinese state-subsidized companies already control the vast majority of the U.S. and global markets.<sup>21</sup>

Many U.S.-based companies have invested heavily in, and in some cases moved, operations to allied countries (including to Australia, Japan, Africa, Europe and the United Kingdom) as foreign regulatory bodies have taken proactive steps to enable the UAS marketplace, such as the comprehensive operational and Uncrewed Traffic Management (U-SPACE) regulations implemented by the European Union. For example, Zipline and Wing have each performed hundreds of thousands of BVLOS deliveries around the world, flying tens of millions of miles autonomously. Not only do those operations provide significant immediate benefits to those countries, but by providing a clear pathway from drone companies to scale and achieve commercial viability, those countries are able to attract investment and jobs in this emerging sector. By contrast, regulatory uncertainty in the U.S. has forced many American UAS companies to shut down. If companies can iterate new models of aircraft and operations and scale their businesses in other countries, the U.S. will continue to experience a loss of UAS investment, innovation, and competition. Once a company is operating abroad, it is unlikely to shift its investments back to the U.S. without regulatory certainty, and the American UAS industry falls behind.

*Enhancing Homeland Security and Emergency Response.* UAS can provide significant homeland security and emergency response benefits. They are frequently utilized in emergency situations, including helping communities recover after hurricanes and other natural disasters by providing Internet connectivity and providing data that assists with cleanup efforts. UAS are frequently employed for public safety to assist first responders with situational awareness in the context of criminal investigations, firefighting, and more.

*Supporting National Security.* A thriving domestic UAS industry that stays at the forefront of innovation is important for economic security, driving investment and creating jobs. It also is important for national security. In recent years, U.S. Federal agencies have issued warnings about systems made by companies connected to countries of concern and expressed a need to deploy secure, domestically produced drones. Congress has also taken action, banning the Defense Department from buying certain foreign-made drones.<sup>22</sup> As UAS technology increasingly revolves around network-connected operations, data security is important, especially for use cases involving sensitive data. Maintaining a strong and secure domestic UAS industry promotes competitiveness and protects national security.

*Upgrading Our U.S. Agricultural Supply Chain.* The benefits of drones can be leveraged to enhance the U.S. supply chain particularly in the context of precision agriculture and bulk materials. As the world population grows from 7 billion to an estimated 9 billion by 2050, agricultural consumption is predicted to increase by 69 percent. Drones can play a vital role in helping the agriculture industry meet this growing demand.

## V. CONCLUSION

The opportunity cost of inaction continues to grow as the gap between technology and policy in the United States continues to widen. Congress has the opportunity in the next FAA Reauthorization to close this gap and bring the benefits of commer-

<sup>19</sup> <https://www.skydio.com/blog/BVLOS-for-remote-drone-operations/>.

<sup>20</sup> “China drafts roadmap to boost its civilian drone industry,” August 23, 2022, found at <https://eandt.theiet.org/content/articles/2022/08/china-drafts-roadmap-to-boost-its-civilian-drone-industry/>.

<sup>21</sup> Cate Cadell, Drone Company DJI Obscured Ties to Chinese State Funding, Documents Show, Washington Post, February 1, 2022, available at <https://www.washingtonpost.com/national-security/2022/02/01/china-funding-drones-dji-us-regulators/>.

<sup>22</sup> National Defense Authorization Act for Fiscal Year 2020, Section 848 (P.L. 116–92).

cial drones to the American public. The CDA appreciates the opportunity to appear before you today to provide our perspective in support of your work. We look forward to continuing to collaborate with you and your staffs to ensure that America is able to maintain and enhance our global leadership in advanced aviation in years to come.

Senator SINEMA. Thank you. Our next witness is Gregory Davis, President and Interim Chief Executive Officer of Eviation, a developer and manufacturer of electric aircraft. Mr. Davis is also a licensed commercial pilot and has over 15 years in leadership roles at aerospace companies. Mr. Davis, thank you for joining us remotely today. You are recognized for your opening statement.

Mr. DAVIS. Thanks very much for having me today. As you said, my name is Gregory Davis, and I am the—CEO of Eviation—manufacture electric aircraft—[technical problems]—coming to Washington. We are manufacturing the world's first all electric commuter aircraft, integrating—

[Technical problems.]

Senator SINEMA. Mr. Davis, we are having a little bit of trouble hearing you. You are cutting in and out. If it is OK with you, I am going to have our tech folks work on that for a second and we will move on and then come back. Is that OK with everyone? Great.

So we will move to our next witness, retired Colonel Steven Luxion, who prefers to go by Lux—I like it. Lux is the Executive Director of the Alliance for System Safety of UAS through Research Excellence at Mississippi State University's Stennis Space Center campus.

He previously served in the U.S. Air Force for more than 30 years, where he led the Air Force's first armed UAV squadron. Lux, thanks for joining us today, and you are recognized for your opening statement.

**STATEMENT OF COLONEL [RET.] STEPHEN P. LUXION,  
EXECUTIVE DIRECTOR, FAA CENTER OF EXCELLENCE FOR  
UNMANNED AIRCRAFT SYSTEMS [ASSURE]**

Mr. LUXION. Thank you. Thank you, Chair Sinema, Ranking Member Cruz, and members of the subcommittee. Thanks for the opportunity to testify today about uncrewed aircraft systems or UAS.

I will speak today for my 7 years' experience as the Executive Director of Assure, a Mississippi State University led alliance of 26 leading research universities and over 100 industry and Government partners that serve as the FAA Center of Excellence. I also served 30 years in the Air Force, where I was fortunate to play a leadership role in the integration of UAS.

From this perspective, I have to say, it is mostly a good news story of innovation, growth, development, and safety. In 2014, Congress called on the FAA to establish a UAS Center of Excellence to provide the academic research, data, and support necessary to inform the FAA and its regulatory responsibilities to integrate uncrewed aircraft safely and efficiently into the national airspace system.

In 2015, the FAA awarded Assure that responsibility through a competitive process. A lot has happened in the 7-years since Assure was established. With the tremendous support of Congress, Assure

has grown from a half a million appropriation to \$14 million in matched funding annually.

To date, congressional support for the FAA through Assure is approximately \$91 million. These funds have supported more than 60 projects, including advanced air mobility, cybersecurity, and the integration of UAS for disaster response, just to name a few.

Assure research has supported FAA rulemaking and the development of industry consensus standards. Additionally, Assure continues to develop a network of worldwide affiliations to harmonize rulemaking and standards globally.

Canada, the United Kingdom, Israel, and Singapore now have affiliate universities in the Assure consortium. Currently, Assure is in discussions with Australia and New Zealand to develop affiliations there.

The COE's work supporting the FAA has led to other developments. We are engaged in nine studies for NASA, which investigate the technologies to support uncrewed aircraft traffic management so critical to beyond visual line of sight operations, multi-UAS control, and improved aviation weather forecasting below 500 feet.

Congress has also supported Assure through FEMA and NIST in the integration of UAS technology into public safety and disaster response. Assure is leading the development of Assured Safe, a federated ecosystem that will provide standards, education, training, testing, certification, and credentialing of first responders' use of UAS in the systems themselves.

Although progress is being made on integration, there are two areas that I believe need attention. First, there is a need for a national UAS road map. From the COE perspective, I see the FAA waiting on signals and investment from industry to tell it where to focus its regulatory efforts. But industry is waiting on the FAA to develop pathways to certification and operations to help reduce their regulatory risk.

The FAA should produce a detailed regulatory roadmap that includes identification of specific regulations and standards to support industry and public safety, an office of primary responsibility for each, and the research necessary to inform their development. It is critical that this road map have milestones and actual dates.

The FAA should involve key stakeholders, including industry, academia, and standard committee leadership in the development of this plan. A detailed roadmap would help all stakeholders, including Congress, to provide appropriate resources, measure success, and make adjustments as required.

Second, Assure requests that Congress suspend its policy on cost share to help improve diversity and inclusion and also increase the amount of research that is so needed to speed rulemaking in standards development.

As we look to grow our capability—as we looked to grow our capability and capacity, and include more partners, we found that cost share requirements are an obstacle to participation for minority serving institutions.

Moreover, during the pandemic, Assure and the FAA demonstrated that cost share—reduced cost share requirements led to actually greater participation in research. A trial period of relief

would increase participation of minority serving institutions in research and eliminate the financial burden and risk across all COE universities.

Increased regulatory progress would also incentivize industry to stay actively engaged. Thank you for your recent efforts to help secure the FAA's extension of Assure as its UAS Center of Excellence through May 2025. I look forward to your questions and collaborating with you and your staffs in the future.

[The prepared statement of Mr. Luxion follows:]

PREPARED STATEMENT OF COLONEL [RET.] STEPHEN P. LUXION,  
EXECUTIVE DIRECTOR, FAA CENTER OF EXCELLENCE FOR  
UNMANNED AIRCRAFT SYSTEMS [ASSURE]

Chair Sinema, Ranking Member Cruz, and members of the subcommittee, thank you for this opportunity to testify today about uncrewed aircraft systems (UAS).

I will speak today from my seven years' experience, as the Executive Director of ASSURE, a Mississippi State University led alliance of 26 research universities and over 100 industry and government partners that serve as the FAA's Center of Excellence. I also served 30 years in the U.S. Air Force, where I was fortunate to play a leadership role in the integration of UAS. From this perspective, I have to say it is mostly a good news story of innovation, growth, development, and safety.

In 2014, Congress called on the FAA to establish a UAS Center of Excellence to provide the academic research, data, and support necessary to inform the FAA in its regulatory responsibilities to integrate uncrewed aircraft safely and efficiently into the National Airspace System. In 2015, the FAA awarded ASSURE that responsibility through a competitive process.

A lot has happened in the seven years since ASSURE was established. With the tremendous support of Congress, ASSURE has grown from the original half a million appropriation to \$14 million in matched funding annually. To date, congressional support for the FAA through ASSURE is approximately \$91 million. These funds have supported more than 60 projects, including advanced air mobility, cyber security, and the integration of UAS for disaster response, just to name a few. ASSURE's research has supported FAA rulemaking, and the development of industry consensus standards.

Additionally, ASSURE continues to develop a network of worldwide affiliations to harmonize rulemaking and standards globally. Canada, the United Kingdom, Israel, and Singapore now have affiliate universities in the ASSURE consortium. Currently, ASSURE is in discussions with Australia and New Zealand to develop affiliations there.

The COE's work supporting the FAA has led to other developments. We are engaged in nine studies for NASA, which investigate the technologies to support uncrewed aircraft traffic management critical to beyond-visual-line-of-sight operations, multi-UAS control, and improved aviation weather forecasting below 500 feet.

Congress has also supported ASSURE (through FEMA and NIST) in the integration of UAS technology into public safety and disaster response. ASSURE is leading the development of "ASSUREd Safe," a federated ecosystem that will provide standards, education, training, testing, certification, and credentialing of first responders' use of UAS and the systems themselves.

Although progress is being made on integration, there are two areas, that, I believe, need attention. First, there is need for a National UAS Roadmap. From the COE perspective, I see the FAA waiting on signals and investment from industry to tell it where to focus regulatory efforts. But industry is waiting for the FAA to develop pathways to certification and operations to help reduce their regulatory risk. The FAA should produce a detailed regulatory roadmap that includes identification of specific regulations and standards to support industry and public safety, an office of primary responsibility for each, and the research necessary to inform their development. It is critical that this roadmap have milestones and actual dates. The FAA should involve key stakeholders including industry, academia, and standard committee leadership, in the development of this plan. A detailed roadmap would help all stakeholders, including Congress, to provide appropriate resources, measure success, and make adjustments, as required.

Second, ASSURE requests that Congress suspend the cost-share policy to help improve diversity and inclusion, and also increase the amount of research needed to

speed rulemaking and standards development. As we have looked to grow our capability and capacity, and include more partners, we have found that cost-share requirements are an obstacle to participation for Minority Serving Institutions. Moreover, during the pandemic, ASSURE and the FAA demonstrated that reduced cost-share requirements led to greater participation and research. A trial period of relief would increase participation of Minority Serving Institutions in research, and eliminate the financial burden and risk across all COE universities. Increased regulatory progress would also incentivize industry to stay actively engaged.

Thank you for your recent efforts to help secure the FAA's extension of ASSURE as its UAS COE through May 2025. I look forward to your questions and collaborating with you and your staffs in the future.

Senator SINEMA. Thank you. We are still working through some of the technical difficulties with Mr. Davis, so we will move on to our next witness. Welcome to an Arizonan, Stephane Fymat, Vice President and General Manager for Honeywell Aerospace's Unmanned Aerial Systems and Urban Air Mobility Business Unit.

He has led Honeywell's Aerospace UAS, UAM business unit since its creation in March 2020. Mr. Fymat, thank you for traveling from Phoenix to Washington D.C. to testify today, and you are recognized for your opening statement.

**STATEMENT OF STÉPHANE FYMAT, VICE PRESIDENT AND GENERAL MANAGER, URBAN AIR MOBILITY AND UNMANNED AERIAL SYSTEMS, HONEYWELL AEROSPACE**

Mr. FYMAT. Chair Sinema, Ranking Member Cruz, members of the Subcommittee, thank you for the invitation to today's hearing to discuss Honeywell's perspective on the upcoming FAA Reauthorization Act, with respect to integrating new entrants into the national airspace system.

My name is Stéphane Fymat. I am the Vice President and General Manager of Honeywell's Urban Air Mobility and Unmanned Aerial Systems Business Unit. Honeywell Aerospace is proudly based in Arizona, a leader in the aerospace industry, and home to 19 of our facilities and nearly 7,000 employees.

Honeywell invented the autopilot over 100 years ago and continues to innovate to this day. We are in a great position to help shape the future of advanced aerial mobility. Our Urban Aerial Mobility Lab in Phoenix is where we are pioneering technologies without which these aircraft just are not possible.

Examples include automated flight control and actuation systems, electric propulsion systems that enable ultra-quiet and emission free aircraft, detect and avoid systems to prevent collisions with other aircraft and obstacles.

In particular, Honeywell invests a large portion of our R&D into technology that makes flight more sustainable, such as electric power generation, hydrogen fuel cells, and sustainable aviation fuel. These new aircraft are set to be the most profound change in the aerospace industry and in people's lives since the invention of the jet engine.

They will take off and land vertically, just like a helicopter, and fly on their wings just like an airplane. During takeoff and landing, they are no louder than a modern dishwasher, enabling them to pick you up and drop you off right in your neighborhood. They can do the same for cargo, enabling companies to fly goods directly from warehouse to warehouse and streamline the supply chain.

Small drones can drop off small parcels directly to your home and emergency supplies to disaster areas. However, the lack of a clear pathway to the certification of these aircraft and an absence of regulation to enable long distance, commercial drone operations challenge this industry.

Countries that lead in the development of new modes of transportation establish or reaffirm their global leadership. We have seen this before in the auto industry, the rocket industry, and the airline industry. But developing is not enough. We must also lead in implementation as well.

Like the U.S. has done in the past with the interstate highway system and like Europe has done with high speed rail, this is the next new mode of transportation, and it is playing out today. The pace of technology innovation is accelerating, which means that the pace of regulation must also accelerate, or the United States will be left behind. It is time to come together to remove the regulatory gaps and make this a reality.

We recommend that Congress mandate the FAA to have AAM aircraft certification regulations enacted by 2024. Validate AAM aircraft certified in Europe using our existing bilateral aviation safety agreements. Ensure its regulations are harmonized with these countries by 2024.

Develop certification standards for autonomous aircraft, including unpiloted and reduced crew cargo and passenger carrying vehicles. And complete the rulemaking to enable regular beyond visual line of sight operations for drones of all sizes by 2024. At Honeywell, our single minded mission is to co-create, together with leading aircraft designers, the advanced aerial mobility industry.

I commend Chair Sinema, Senator Moran, and the committee for the recent passage of the bipartisan Advanced Air Mobility Coordination and Leadership Act. I also applaud the efforts of the FAA, particularly in the Beyond Visual Line of Sight Rulemaking Committee, for working more closely with industry and stakeholders.

Next year's FAA Reauthorization Act presents an important opportunity for Congress to make U.S. global leadership in AAM and drones a top national priority and address the remaining regulatory gaps. Thank you for the opportunity to be here, and I look forward to your questions.

[The prepared statement of Mr. Fymat follows:]

PREPARED STATEMENT OF STÉPHANE FYMAT, VICE PRESIDENT AND  
GENERAL MANAGER, URBAN AIR MOBILITY AND UNMANNED AERIAL SYSTEMS,  
HONEYWELL AEROSPACE

Chair Sinema, Ranking Member Cruz, and members of the subcommittee,

Thank you for the invitation to join today's hearing to discuss Honeywell's perspective on the upcoming FAA Reauthorization Act with respect to integrating new entrants into the National Airspace System.

My name is Stéphane Fymat, I am the Vice President and General Manager of Honeywell's Urban Air Mobility and Unmanned Aerial Systems business unit. Honeywell Aerospace is proudly based in Arizona, a leader in the aerospace industry and home to 19 of our facilities and nearly 7,000 employees.

Like the aviation industry we thrive on today, Honeywell Aerospace started its aerospace journey over 100 years ago by inventing the autopilot and continues to do so to this day. We are therefore uniquely positioned to help shape the future of Advanced Aerial Mobility.

Honeywell's Deer Valley facility in Phoenix, Arizona is home to our Urban Aerial Mobility lab—here we are innovating and pioneering many of the critical technologies without which these aircraft are just not possible, such as:

- Automated flight control and actuation systems that enable these vehicles to take off like a helicopter and fly like an airplane,
- Electric, hybrid-electric and hydrogen-powered propulsion systems that enable ultra-quiet and emissions-free vehicles, and
- Detect-and-avoid systems to prevent collisions with aircraft and other objects.

In particular, Honeywell invests a large portion of our R&D into next-generation technology that makes flight more sustainable, such as electric power generation, hydrogen fuel cells, sustainable aviation fuel, and more. Our commitment to sustainability is an integral aspect of our design of products, processes, and services, and of the lifecycle management of our products.

The introduction of Uncrewed Aerial Systems (aka drones or UAS) and Advanced Aerial Mobility vehicles (AAM) is set to be *the most profound change* in the aerospace industry and in people's lives since the invention of the jet engine.

These new aircraft take-off and land vertically, just like a helicopter, and fly on their wings, just like an airplane. During takeoff and landing, they are no louder than a modern dishwasher, enabling them to pick you up and drop you off right in your neighborhood. They can do the same for mid-sized cargo, enabling organizations to skip the airports and ship goods directly from warehouse to warehouse to streamline the supply chain. Small drones can drop off small parcels directly at your home, emergency supplies to disaster areas, and urgent and vital medical packages to paramedics and hospitals.

However, there are *challenges that threaten* to delay the emergence and development of this industry, including the *lack of a clear pathway to the certification of these aircraft and an absence of necessary regulations to enable long-distance commercial drone operations*.

Countries that lead in the development of new modes of transportation establish or reaffirm their global leadership. We have seen this before—in the automobile industry, the rocket industry and the jet airliner industry.

Countries that lead in the implementation of new modes of transportation within their borders also establish or reaffirm their global leadership. We have also seen this before—in the U.S. with the interstate highway system, and in Europe with high-speed rail. Advanced Aerial Mobility is the next new mode of transportation, and it is playing out today.

The pace of technology innovation is accelerating, which means that the pace of regulation must also accelerate—or the United States will be left behind.

At Honeywell, our *single-minded mission* is to co-create, together with leading aircraft designers, the advanced aerial mobility industry. We see a world where:

- Urban and regional air travel is safe, accessible and ubiquitous,
- 100-mile trips are made in less than 45 minutes door-to-door,
- Cargo can be delivered autonomously to both rural and urban areas—from the warehouse to your door,
- Same day delivery is possible even in remote locations,
- Challenging but essential missions like border patrol and pipeline inspections can be done at scale, autonomously,
- And all the above can be done without major infrastructure expansion (*e.g.*, roads, airports)

It's time to come together—as *policymakers, regulators, and technology leaders*—to address aerial mobility and remove *regulatory gaps* remaining on the path to success.

*Congressional and White House leadership is critical to:*

- a. First, prioritize the regulatory urgency required to achieve U.S. global leadership in UAS and UAM, this must become a national priority to succeed; for all regulatory priorities the timeline to achieve them is a critical factor to industry success and U.S. leadership, there must be an ambitious expedited timeline set out by Congress to ensure regulatory urgency and drive integration;
- b. Second, to ensure a whole-of-government coordinated approach across Federal agencies and collaboration with industry, state and local governments, and stakeholders;

- c. Last, to ensure the Federal government invests the resources necessary to accomplish these goals.

In order for the United States to maintain its global leadership position and to enable industry, we recommend Congress directs the FAA to address the following regulatory gaps:

#### **Aircraft Certification**

1. *Mandate the FAA to have certification regulations for piloted VTOL aircraft enacted by 2024.* Without regulation by 2024, U.S. AAM manufacturers will be left behind their global counterparts, the public will not reap the benefits of flying on these aircraft, and the United States will miss a crucial opportunity to lead the future of aviation.
2. *Mandate the FAA to validate AAM aircraft certified by the European Union Aviation Safety Agency (“EASA”), the United Kingdom’s Civil Aviation Authority (“UK CAA”) and other similar authorities using our existing bilateral aviation safety agreements and associated technical implementation procedures.* The United States already has the regulatory frameworks in place to accept foreign aircraft certifications. Reaffirming this fact with a mandate provides a clear pathway for any foreign manufacturer to have their aircraft certified in the United States and ensure that the United States public is at the front of the line to receive the benefits of all these aircraft—wherever they may have originated from.
3. *Mandate the FAA to ensure that its aircraft certification regulations are harmonized with EASA and UK CAA by 2024.* FAA global leadership is needed to harmonize AAM certification with EASA and other countries to ensure that AAM can grow as a global industry and that American aircraft manufacturers and operators can access vital international markets for AAM.
4. *The FAA should prioritize the development of certification standards for autonomous aircraft, including unpowered and reduced-crew cargo and passenger-carrying vehicles.* This will enable the United States to lead in autonomous aviation, and to accelerate the introduction of safe autonomy and automation technologies into aircraft.

#### **Operations Regulation**

5. *The FAA should complete rulemaking to enable regular Beyond Visual Line of Sight (BVLOS) operations for all UAS vehicles by 2024.* BVLOS regulations are critical to the UAS industry, not just for small drones, but for drones of all sizes. Without them the industry cannot scale, innovation will be stifled and drone-related services in the United States will be severely limited.
6. *The FAA should complete certification rules for the operation of both piloted AAM aircraft and drones in the United States by 2024.* The current set of rules apply to small drones but leave a gap for larger ones that are more practical for missions such as transporting cargo and supplies.

I commend Chair Sinema, Senator Moran, and the Members on this Committee, for supporting the success of this industry through legislation like the recent passage of the bi-partisan Advanced Air Mobility Coordination and Leadership Act.

I also applaud the efforts of the Federal Aviation Administration, particularly over the last several years including the BVLOS Aviation Rulemaking Committee (ARC), to work more closely in partnership with industry and stakeholders to drive regulatory progress.

Next year’s FAA Reauthorization Act comes at a critical time and presents an important opportunity for Congress to take decisive action to prioritize U.S. global leadership and address the regulatory gaps that inhibit UAS and UAM industry growth.

If we as a country miss this opportunity, we will likely see another country replace the United States as the new global leader in aviation technology in the coming decade.

Success will require a more coherent whole-of-government coordination and partnership with state and local governments, industry, and stakeholders. Working together, I am confident we can achieve this outcome.

Thank you for the opportunity to be here today and I look forward to your questions.

Senator SINEMA. Thank you. Next, we have Ed Bolen, the President and CEO—President and CEO of the National Business Aviation Association. Mr. Bolen has led NBAA since 2004 and pre-

viously served in senior leadership roles at the General Aviation Manufacturers Association.

He was appointed by President George W. Bush to serve on the Commission on the Future of the U.S. Aerospace Industry. Mr. Bolen, thank you for joining us today, and you are recognized for your opening statement.

**STATEMENT OF EDWARD M. BOLEN,  
PRESIDENT AND CHIEF EXECUTIVE OFFICER,  
NATIONAL BUSINESS AVIATION ASSOCIATION**

Mr. BOLEN. Well, thank you, Chair Sinema, Ranking Member Cruz, members of the Subcommittee. It is a great honor to be here today talking about an important milestone in the evolution of on demand air mobility. You know, for decades, the National Business Aviation Association has represented companies that rely on general aviation aircraft to get people and products where they need to be, when they need to be there.

Over the decades, that has been evidenced in a variety of technologies. Companies have used biplanes and monoplanes, fixed wing aircraft, and rotor wing aircraft. They have used propulsion systems, including radios and pistons and turbines.

And the aircraft themselves have been built with wood and fabric, aluminum, and composites. Today, the United States is fortunate to have the world's largest, safest, most efficient, and most diverse air transportation system in the world, and our work—country has benefited enormously from that.

But today, we have an opportunity to talk about technologies that can do even more. In your opening remarks, several of you mentioned the importance of predictability and certainty. And let me say this, we are all certain that advanced air mobility has the potential to bring enormous benefits to our country, to our citizens, to our communities.

It has the potential to bring societal benefits, and economic benefits, and national security benefits. As the ability to make on-demand air mobility more sustainable, more accessible, more affordable, we want, and we need advanced air mobility. Here are some of the things that we as a country need to do.

As Stéphane said we need to make it a national priority. We need a coordinated national strategy. We also need transparency, communication, and certainty in our regulations and our process. We need to have concurrent collaborative work being done. Like the others, I want to thank Senators Sinema and Moran for the AAM Coordination and Leadership Act.

That is important because it brings together different departments within the U.S. Government to make sure we are working together not at cross-purposes. I also want to focus on what we need to do in terms of coordination and communication within the FAA. And that is we need to be concurrent and collaborative across all of the various lines of business.

In order for AAM to come to the forefront, companies will need to get type certificates. They will need to get production certificates. The operators will need operation specifications. And we are going to need an infrastructure that facilitates those operations.

We need to work collaboratively and concurrently for all of those eventualities, not sequentially, one after another.

This is an important opportunity. And I have already mentioned the infrastructure and it is an infrastructure that is forward looking. Today, the United States is blessed to have an amazing network of general aviation airports, 5,000 public use airports. They are in every Congressional District. They are in some of our tribal areas.

They provide access to our air transportation system, to the world economy. In order for us to move forward, we need to recognize that the infrastructure of the future will require electrification. It may require hydrogen.

We have an opportunity to build for the future now. Here again, I want to thank Senator Moran, who worked with Senator Padilla to introduce, and this committee has passed, the Advanced Aviation Infrastructure Modernization Act, an important opportunity to plan—to provide grants for the planning and construction of the infrastructure of tomorrow.

We need to be about that today. We also need to focus on the workforce of tomorrow. We are talking about technologies that are relying on electric propulsion, things that we don't necessarily have expertise within the FAA and within some of the communities.

We need to focus on how we bring the best and the brightest into our community as we go forward. As I said before, this is an important milestone in the evolution of transportation. It has the opportunity to benefit American citizens, communities, and our country.

We look forward to working closely with every member of this committee, every Member of Congress, everyone in the executive branch, and people all over the country to realize the benefits of advanced air mobility. Thank you.

[The prepared statement of Mr. Bolen follows:]

PREPARED STATEMENT OF EDWARD M. BOLEN, PRESIDENT AND CEO,  
NATIONAL BUSINESS AVIATION ASSOCIATION

Chair Cantwell, Ranking Member Wicker, Subcommittee Chair Sinema, Subcommittee Ranking Member Cruz and members of the Subcommittee on Aviation Safety, Operations, and Innovation, thank you for holding this hearing to address the integration of new entrants into the national airspace system (NAS). On behalf of the National Business Aviation Association's (NBAA's) 11,000-member companies and our Advanced Air Mobility Roundtable, I am honored to testify at this hearing.

NBAA's members, many of which are small businesses, rely on general aviation aircraft to meet some portion of their transportation needs. These aircraft provide connectivity to communities in every state and nearly every congressional district, many of which do not receive airline service. While those airlines serve only around 500 airports, business aviation can reach 5,000 airports, located in places some people have never heard of. This unique American idea of connecting each other—no matter where we live and work—doesn't make headlines, but it supports 1.2 million American jobs and \$247 billion in economic output.

As the Subcommittee knows, general aviation is an essential American industry that has long led the way in innovations that generate new technologies and new ways of thinking. We led the way with GPS, a transformative navigation and safety technology. We led the way with winglets and other technologies that drive safety and efficiency. We are leading the way in the next revolution in aviation, Advanced Air Mobility (AAM). These and other advancements make aviation safer, more secure and sustainable, and ensure that our country will remain the world's leader in aviation five, 10 and 25 years from now.

With the current authorization of the Federal Aviation Administration (FAA) expiring a little more than a year from today, this hearing comes at a crucial time, when the United States is on the cusp of a new and exciting era of aviation. We

appreciate the work this Subcommittee is already doing to engage with all stakeholders on priorities for a long-term FAA reauthorization bill in 2023, and we look forward to a robust discussion about new entrants into the NAS.

As this committee knows, the U.S. has been at the forefront of aviation leadership and innovation for decades. Modern aviation was born on America's shores with the first powered flight in Kitty Hawk, North Carolina. We led the transition from piston engines to the jet age. We pioneered air traffic control technology and airspace policies that created the safest, most efficient and most diverse air traffic system in the world. Our robust aviation infrastructure is unparalleled and our workforce, while greatly affected by the COVID pandemic, remains the most agile, innovative and sought-after in the world.

We have the potential to continue to lead the next phase in the evolution in aviation with AAM, but competition with other nations is fierce and rapidly advancing. Among other considerations, this means the FAA will need to keep pace with its promised regulatory schedule, so that the first AAM commercial operations can occur as soon as 2024. This is a critical milestone if we are to fully scale this promising new technology.

In short, we stand at a critical juncture—the investments and policy decisions we make today will determine whether we harness the full economic, environmental and national security potential of AAM and maintain our position as a global leader in aerospace.

#### **Advanced Air Mobility: A Pioneering Promise for Communities and Commerce**

Advanced Air Mobility is an emerging form of on-demand air transportation powered by electric vertical takeoff and landing (eVTOL) technology. It can safely, securely, and successfully deliver people and cargo between locations, making connections that are not easily achievable by existing aviation technologies, such as delivering healthcare in remote rugged terrain, providing affordable transportation options within a congested metropolitan area, offering relief in the aftermath of a natural disaster, increasing access to rural or mid-sized communities, or linking the remote spokes of a cargo distribution network to shorten the supply chain.

AAM has the potential to make aviation more accessible, more environmentally sustainable and more economically beneficial than at any time in history. According to a recent study by Deloitte, the AAM market in the United States is estimated to reach \$115 billion annually by 2035, creating more than 280,000 high-paying jobs.<sup>1</sup>

The development, certification and use of AAM promises to deliver a host of benefits, including:

- **Job Creation and Economic Growth.** Analysts predict the AAM sector will generate hundreds of thousands of high-skilled jobs in manufacturing, design and infrastructure by 2040, centering around the 5,000 existing and underutilized airports in towns and cities across the country. AAM will also deliver huge commercial and economic benefits by increasing productivity and making it easier to move key employees and goods and provide services in locations across the country.
- **Accessibility.** AAM technologies provide passengers with a safe, affordable, flexible and efficient form of mobility, making AAM a valuable solution for cities struggling with road congestion. It offers the potential to close the gap between urban and rural communities by facilitating connections between areas separated by limited public transportation and difficult terrain. And it offers a critical solution for health care challenges such as time-critical organ transportation.
- **Sustainability.** AAM is part of business aviation's many efforts to become more sustainable year over year. The aircraft are powered by hybrid electric systems, batteries and hydrogen fuel cells, making them a highly sustainable, carbon neutral form of air transport. The aircraft are also quiet, and less disruptive.
- **National Security.** AAM will benefit America's defense and national security interests. AAM vehicles are short range, runway independent and automated. These innovations have real national security applications, including enabling militaries to more easily pursue complex missions that are currently conducted using traditional modes of transport like ground vehicles and helicopters. AAM technologies also have the potential to elevate military use of unmanned aircraft systems for national defense.

<sup>1</sup> <https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html>

In addition to the incredible opportunities contemplated by the introduction of AAM, Unmanned Aircraft Systems (UAS), often called drones, continue to demonstrate tremendous value and public acceptance in areas such as search and rescue, public safety and security, life-saving medical supply transport, package and cargo delivery and other innovative transportation needs. With the FAA's first UAS certification recently taking place, we're excited to see additional certificated UAS finding their way into U.S. operations.

**Needed: A Coordinated Strategy to Propel the Next Generation of U.S. Aviation Leadership**

The support of Congress and the administration, along with collaboration among industry leaders under a coordinated, transparent and predictable national strategy is essential to support the emergence of AAM and ensure all Americans can benefit from the economic, environmental, national security and connectivity benefits it can provide. Several analysts have looked at the best way to foster this coordination. Among them comes guidance from McKinsey, which has conducted a helpful study, highlighting the ways to address the new challenges related to technology, regulation, cost and customer acceptance to achieve higher adoption rates, and unlocking a market that could grow to \$600 billion annually<sup>2</sup>.

Unlocking this potential is the idea behind the Advanced Air Mobility Coordination and Leadership Act. Thanks to the leadership of Subcommittee Chair Senator Kyrsten Sinema (D-AZ) and Senator Jerry Moran (R-KS) in the Senate, as well as Vice-Chair Sharice Davids (D-KS) and Ranking Member Garret Graves (R-LA) in the House, the bill is on its way to the President's desk to be signed into law.

For AAM to succeed, we need coordination at the federal, state and local levels, and that's what the Advanced Air Mobility Coordination and Leadership Act calls for, requiring collaboration through a working group of stakeholders at all levels. This first-of-its-kind working group will review policies and programs to help advance the maturation of AAM aircraft operations and create recommendations regarding the safety, security and Federal investments necessary for the development of AAM.

As a stakeholder organization, NBAA supports the work of congressional leaders to foster the growth of this promising technology. That's why last year, NBAA established the Advanced Air Mobility Roundtable, which serves as a forum for high-level policy planning with sector leaders to chart a course for the integration of AAM technologies into the Nation's airspace system. This group provides a voice for original equipment manufacturers and others who are developing electric vertical takeoff and landing transport (eVTOL) vehicles and other systems, with regard to airport access, airspace management, local community engagement and other critical priorities.

NBAA also collaborates closely with the Congressional Advanced Air Mobility (AAM) Caucus, established in June of this year, which will be critical in helping to educate Members of Congress about this revolutionary emerging technology. Caucus members will work to identify policies that will stimulate the industry, promote safety, address infrastructure needs, and engage in advanced air mobility's modernization of existing transportation networks.

We encourage Congress to continue to fund essential programs that create partnerships between government agencies, the military and stakeholders to bring AAM to fruition. In particular, the U.S. Air Force's AFWERX/Agility Prime and NASA's AAM National Campaign greatly aid in expediting the certification process and testing of AAM operations, traffic management systems, infrastructure, and capabilities as validating system-level concepts and solutions. NBAA's AAM Roundtable members including Archer Aviation, Beta Technologies, Joby Aviation, Supernal, and Wisk are successfully utilizing these programs.

Joby Aviation and NASA collaborated with the FAA to develop five use cases for operations in the Dallas-Fort Worth (DFW) region. The report demonstrated AAM aircraft could navigate in the current National Airspace System between vertiports through high-volume conventional air traffic, and that more work should be done to develop ways to scale operations. In March, Beta Technologies' aircraft, Alia, became the first manned electric aircraft flown by U.S. Air Force pilots as part of its Agility Prime technology acceleration program. This paved the way for Alia's groundbreaking journey from New York to Arkansas, which covered 1,403 miles, made seven stops and spanned six states. And, most recently, Wisk released its Concept of Operation, citing years of collaboration with Boeing, the FAA and NASA.

<sup>2</sup> Are Flying Taxis in Our Future? <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/taxiing-for-takeoff-the-flying-cab-in-your-future>

Congress and agency leaders understand the importance of government-industry partnerships to foster the development of AAM. Earlier this year, the FAA amended the charter for the Drone Advisory Committee to include AAM integration and renamed it the Advanced Aviation Advisory Committee (AAAC). The AAAC will serve as a valuable forum to advance AAM policy and advise the FAA; however, the committee must bring on board more AAM members to honor equal representation reflected in the charter, and be most effective in charting the future for this emerging sector.

**In Focus: Certification Challenges for Emerging Aircraft Technologies**

With the electrification of aviation leading to the introduction of new entrants, long-established safety oversight concepts will need updates that reflect the latest technology, design and operations on the horizon. And while the pace of technological change often outruns the ability of regulatory standards for compliance to adjust, the safety of the traveling public must always remain our North Star.

The FAA's rigorous processes for aircraft certification have long been a model for international acceptance of U.S. aviation products. Additionally, regulations set forth by the Department of Transportation (DOT) and FAA ensure that companies seeking to provide air transportation to the public comply with comprehensive operational safety standards. Together, these aircraft and operational approvals create a framework for the safe introduction of new aircraft and new operations. That said, regulators will need to think in new ways about the certification of new technologies with implications for aviation safety.

That evolving shift in perspective appears to be underway: As this committee knows, the FAA recently changed the certification process for AAM aircraft. As part of that decision, the agency committed to introduce a Special Federal Aviation Regulation (SFAR) by 2024 to coincide with the planned introduction of the first advanced air mobility (AAM) commercial operations. This is a critical step in the path to enable commercial AAM operations and pilot licensing, and we welcome the agency's declaration that this change preserves consistency in certification for safety without introducing cumbersome delays to the necessary processes for marketplace introduction.

We ask that this Subcommittee closely monitor the agency's stated goal of completing the process for AAM introduction into the NAS by 2024. Transparency and certainty from the FAA are important. For example, the first aircraft type certification for an AAM aircraft is expected shortly, and companies are progressing toward operational certification, so the timely completion of an SFAR with engagement from industry stakeholders is crucial for the successful launch of commercial service.

Adherence to the FAA's stated timetables must be viewed as a top agency imperative. Although operators of AAM aircraft have not yet sought FAA commercial operational certification, the moment is at hand to begin testing operational approval concepts now with FAA safety leaders. New aircraft and new operations frequently take a significant amount of time to safely evaluate, and we cannot wait until 2024 to begin evaluating AAM operational safety needs.

While aircraft and operational certification are a major priority, we must also acknowledge the significant work happening in parallel to address other critical components of this new entrant capability, including air traffic operations and heliport and vertiport design considerations. Each of these work streams must integrate seamlessly if we hope to realize the potential benefits of our efforts.

For example, in addition to AAM operations that focus on passenger-carrying operations, UAS aircraft continue to demonstrate growing value in critical areas such as search and rescue, public safety and security, package and cargo delivery, life-saving medical supply delivery and other innovative transportation models. Proof-of-concept projects in the U.S. have shown public acceptance and desire for these services. We strongly believe these projects should set the stage for more predictable aircraft and operational certifications.

As part of the upcoming FAA Reauthorization, we look forward to a continued dialogue on how the agency can utilize the existing regulatory structure and innovative operational and aircraft certification concepts to facilitate the safe introduction of these technologies. Providing general aviation with certainty for certification, airspace integration, operational approvals, airport investment and infrastructure standards development will all be critical for the United States to remain a global leader in aviation.

### **A Top Priority: New Ways of Thinking About Safe, Efficient Airspace Management**

With the evolution of multiple transformative technologies, ensuring the NAS is ready and able to facilitate the safe integration of operations is critical to maintaining America’s global leadership in safe, efficient air traffic management.

This exciting future is one that we fully embrace. Emerging entrants are planning to operate within the existing airspace infrastructure and environment to the greatest extent possible, without placing an additional burden on the air traffic control system. As we have with all operations, over many decades, we will readily integrate these entrants into the NAS, under the fundamental principle that the public airspace welcomes all users. That said, it must be understood that, as operations scale, we will need regulatory changes to facilitate growth and above all, safety.

For example, UAS have paved a new regulatory path for “beyond visual line of sight” (BVLOS) operations. We welcome the changes the agency is making to allow this segment of the industry to integrate safely, and we know it will speed our progress across the board in realizing the safety and operational benefits of emerging technologies, so we can bring them online.

We can learn some lessons from the safe integration of UAS into the NAS. Over the past several years, initiatives, including the UAS Integration Pilot Program and several other test sites around the country, have allowed the industry and the FAA to collect data regarding BVLOS operations and demonstrated these operations can operate safely.

Successful public-private partnerships involving new entrants are coming together every day. Hillwood’s Alliance Texas planned community is centered around the world’s first industrial airport, which hosts a Mobility Innovation Zone (MIZ). The MIZ brings together public and private stakeholders in suburban and urban settings to safely integrate UAS technologies and autonomous freight solutions. Bell Textron and NASA’s Systems Integration have utilized the MIZ to demonstrate breakthroughs in “Detect and Avoid” and “Command and Control” flight capabilities, two components needed to safely scale and commercialize Advanced Air Mobility vehicles.

It’s now time to do the same with AAM through the establishment of local, state, tribal and government partnerships to advance the data collection and collaboration needed to facilitate initial and scaled AAM operations across the country.

That dialogue has begun through the FAA’s AAAC, but it will take additional representation from the AAM community on the AAAC, and some very specific AAM pilot programs established between the FAA, state and local entities, working collaboratively, to ensure continued and shared outcomes.

### **AAM’s Promise in Building the Workforce of the Future**

The important dialogue about AAM integration into our Nation’s aviation system should not overlook the technology’s role in supporting a major industry priority: the development and support of a world-leading workforce. By some estimates, we’re looking at an astonishing 280,000 new jobs coming online, in twenty-first century positions, meaning those in Science, Technology, Engineering and Mathematics.

The subcommittee is aware that we need these jobs because we face significant workforce challenges, including the shortage of qualified pilots and technicians. According to the Boeing company, more than 600,000 new pilots and technicians are needed to address projected growth in the next 20 years<sup>3</sup>. Meeting this projected demand is dependent upon the investment in a steady pipeline of newly qualified personnel to replace those who have left, or will soon leave the industry.

The growth of the AAM sector will offer the high-skill, high paying jobs people want—and the FAA will need the support of Congress in making that happen, through workforce initiatives to focus on hiring people with the right technical skills to ensure the safety of these evolving technologies.

The industry is ready to do its part as well. We recognize these new opportunities provided by UAS and AAM will require us to bridge the gap between technical aviation skills and technology. New types of training will remove significant barriers to entry into aviation, making it affordable and scalable, and opening doors for individuals who previously were unable to get started in aviation because of the expense of education, flight training, and certification. This new technology offers different ways to think about UAS and AAM flight operations, including unique pathways to employment and education that have not been seen before.

This is the imagination behind the Promoting Service in Transportation Act, passed into law through the Infrastructure Investment and Jobs Act (IIJA), within

<sup>3</sup>Pilot and Technician Outlook 2022–2041: <https://www.boeing.com/commercial/market/pilot-technician-outlook/>

DOT. We appreciate Chair Sinema's leadership on the legislation and the support of this Subcommittee for this measure.

Moving toward the upcoming FAA Reauthorization, we look forward to building on programs from the 2018 FAA bill, including grant programs to support the education of future pilots, the recruitment of much-needed aviation technicians and the introduction of other much-needed professionals into our sector. The careful review and adoption of the recommendations of the Youth Access to American Jobs in Aviation Task Force, and the Women in Aviation Advisory Board, will provide excellent starting points along these lines.

**Effective Planning from Congress Has Laid the Groundwork for the Next Phase in Aviation's Evolution**

More than 70 percent of passengers utilize only 30 of the Nation's airports. The nearly 5,000 local and regional airports will be the launching pad for AAM. A number of airports are collaborating with electric aircraft manufacturers to install AAM charging infrastructure, and many airports are actively planning for the arrival of electric aircraft, understanding the importance of supporting these new entrants. Airports are looking for innovative ways to adapt their business model and take advantage of their geographic location to provide the most value to leverage this fast-growing segment of the aviation industry. We encourage Congress to continue to find ways to support airports in this mission, so we can ensure regulations and lack of funding are not impediments to the critically needed growth of the sector at this crucial time.

As the result of our already robust network of general aviation airports, which are located in urban centers as well as suburban and rural areas, many communities are ready to benefit from AAM and reap the benefits of decades-long federal, state, and local investment that has been made in this vital infrastructure. Nearly 90 percent of the population lives within 30 minutes of a regional airport. Due to lower projected travel costs, AAM will enable many more people to utilize their local airport for air transportation, significantly growing the advantages of having an airport in proximity to them.

However, a number of communities are being shortsighted about the value of their airport, seeking to limit access and in some cases vying to shutter what is unarguably their most valuable community asset. As we stand on the brink of Advanced Air Mobility taking flight, with quieter, zero emissions electric aircraft, cities should be encouraged to preserve and invest in infrastructure that could be the cornerstone of economic revitalization and community accessibility. We urge Congress to continue to protect and invest in the Federal aviation infrastructure that is the foundation of our Nation's air transportation system.

We applaud Congress for supporting the Airport Improvement Program (AIP) and numerous airport relief and investment packages it has recently championed, and we encourage future investment. Without Congressional support and leadership, many local municipalities would not be able to maintain the infrastructure that links their community to the rest of the country and to the world.

Along these lines, we commend this committee for favorably reporting S. 4246, The Advanced Aviation Infrastructure Modernization (AAIM) Act sponsored by Senator Alex Padilla (D-CA) and Senator Jerry Moran (R-KS). The AAIM Act authorizes funding to plan for new AAM infrastructure by leveraging existing public transportation facilities to support AAM operations and fostering engagement programs to introduce the latest technologies to diverse communities. This legislation will position the United States to maintain its global leadership in aviation while providing the tools to create thousands of new green jobs for our skilled aviation workforce. We applaud House Aviation Subcommittee Chair Rep. Rick Larsen, and House Committee on Transportation and Infrastructure Ranking Member Rep. Sam Graves for moving the companion bill H.R. 6270, through the House of Representatives. We look forward to collaborating with this committee to advance the AAIM Act through the Senate.

Expanded aviation charging infrastructure will be another crucial element to achieve the benefits AAM can bring to diverse communities. Without the necessary charging infrastructure in place, it is difficult for private businesses and individuals to be confident enough to switch to cleaner, electric aviation. We have seen a similar dynamic with the transition to electric vehicles (E.V.) in automobiles, and policymakers have responded appropriately by providing tax incentives for businesses and individuals and grants and formula funding for state and local governments to install E.V. charging stations.

The Alternative Fuel Vehicle Refueling Property Tax Credit (section 30C of the Internal Revenue Code) allows for a 30 percent tax credit for the cost of any qualified alternative fuel vehicle refueling property, which includes electric vehicle charg-

ing stations and hydrogen refueling stations. Recognizing the challenges posed by climate change and the need to accelerate the transition to a decarbonized future, the Administration and Congress have released proposals to enhance and extend the section 30C tax credit for E.V. charging stations.

NBAA and our AAM Roundtable support a simple technical change to modernize the section 30C tax credit to ensure that the critical investments necessary for AAM, or electric aviation, charging infrastructure are similarly covered and deployed. Leveraging private investment with an expanded Sec. 30C tax credit is key to the successful rollout of charging stations for electric aviation across our network of more than 5,000 public-use airports.

Earlier, I mentioned that this committee hearing comes at an appropriate moment, given the imminent consideration of the next FAA reauthorization. For NBAA, another milestone is at hand: our association's annual Business Aviation Convention and Exhibition will occur in Orlando, Florida, next month where we will have on display the latest advancements in AAM technology. Just a few miles away from the event, the community of Lake Nona has partnered with our AAM Roundtable member, Lillium, to create the first hub location for a high-speed electric air mobility network in America to be launched by 2026. Described as the "Future of Cities" by Fortune Magazine, Lake Nona provides an ideal location contiguous to the Orlando International Airport, the origination site of more than half of the region's 75 million annual visitors, with a robust economy and infrastructure ready to support the launch of electric air mobility.

We commend the FAA Office of Airports for its recent efforts in developing interim guidance and standards for vertiports and updating the standards for heliports. The FAA has released Engineering Brief (EB) 105 titled "Vertiport Design" targeted to specifically support Advanced Air Mobility vertical take-off and landing (VTOL) aircraft with the goal to ultimately develop a future Advisory Circular on the subject, to be released in 2024–2025 timeframe. The agency plays an important role in the process of developing this new type of infrastructure that will be critical to connecting more cities, towns, and small communities by air with the ability to leverage eVTOL aircraft.

While much work in this area remains ahead, the aviation industry looks forward to continued partnership and collaboration with the FAA, Congress and other branches of the federal, state, local and tribal governments, and remains optimistic that together we continue to move aviation infrastructure forward at a pace that keeps up with developing technologies and community needs.

#### **The Flight Plan for AAM as Part of America's Aviation Leadership**

In conclusion, as Congress prepares to reauthorize the Federal Aviation Administration, the NBAA recommends the following priorities to ensure the safe integration of AAM and help scale the new technology:

- Provide transparency and certainty in the regulatory process, including a commitment to deliver the powered lift Special Federal Aviation Regulation by 2024.
- Develop a national strategy to coordinate AAM integration at the federal, state and local levels to include AAM demonstration cities modeled after the UAS Pilot Program.
- Continue to invest in the infrastructure and other assets that will promote the manufacture, availability and use of these world-leading technologies. We applaud Congress for the work done in this area, but more will need to be done. We urge passage of S. 4246, or HR 6270, The Advanced Aviation Infrastructure Modernization (AAIM) Act.
- Preserve congressional oversight of the Nation's aviation system. Having Congress serve as the board of directors for the NAS has always ensured that all stakeholders are represented; as we introduce new technologies, oversight from Congress will remain critical to ensuring America's aviation leadership across the world.

This hearing and similar discussions with policymakers in the coming months will serve as the building blocks for successfully integrating new entrants into the NAS. Our industry looks forward to continued engagement as we develop policy solutions that safely embrace new aviation technologies and maintain the role of the United States as the world leader in aerospace. General aviation is witnessing historic technological advancements that will connect communities to sustainable transportation options. NBAA, our AAM Roundtable, and our members appreciate this Subcommittee's continued leadership, and we welcome the opportunity to testify at this critical hearing.

Senator SINEMA. Thank you. Now we will go back to Gregory Davis, the President and Interim Chief Executive Officer of Eviation. And Mr. Davis, thank you so much for joining us today, and you are recognized for your opening statement.

**STATEMENT OF GREGORY DAVIS, PRESIDENT AND CHIEF EXECUTIVE OFFICER, EVIATION**

Mr. DAVIS. Thank you very much. And if I may, to confirm that the audio is now working.

Senator SINEMA. It is. Thank you.

Mr. DAVIS. Lovely. Thank you very much. Well, good afternoon. My name is Gregory Davis, and I am the President and CEO of Eviation Aircraft. We are a manufacturer of all electric aircraft based in Arlington, Washington. And we are currently in the process of developing the world's first all-electric commuter aircraft with fully integrated battery technology and electrical propulsion.

Chair Sinema, Ranking Member Cruz, Chair Cantwell, and Ranking Member Wicker, and members of the Subcommittee on Aviation Safety, Operations and Innovation, thank you for the opportunity to testify on the policies and regulations needed to usher in the new era of sustainable aviation.

Yesterday, and I should thank you again for the very warm welcome, yesterday we successfully completed the first flight of our zero emission aircraft, Alice. It was an historic day for aviation history and a major milestone in electric aviation. It is the first time that an aircraft of this scale has successfully completed a flight.

And there was a moment of great pride for, I would say, all of us at Eviation and for the aviation community in general. We were able to show people what affordable, clean, and sustainable aviation looks like and sounds like for the first time in a fixed wing, all electric aircraft.

It has taken collaboration across the aviation ecosystem to reach this groundbreaking moment. It is my hope that 1 day this type of travel will be so prevalent in our society we will not need to use the word electric to describe it. Electric aviation has the power to transform communities across this country.

Specifically, it can restore or provide essential air services to rural communities that are often underserved. Today, only about 500 of the 5,000 airports are served by any commercial flight, despite 60 percent of the population being within ten miles of an airport, active or not, and 95 percent being within 25 miles.

We have already seen early market traction from forward thinking operators, including Cape Air and Global Crossing for passenger travel and global cargo company DHL for e-cargo. Today, I am here to share my insights on the key areas that must be prioritized in order to make electric aviation the standard for regional travel in the United States and beyond.

My comments will be addressed around e-CTOL, the electric conventional takeoff and landing aircraft market, while acknowledging my greater support for the advancement of all aspects of urban air mobility and sustainable aviation. e-CTOL, like Eviation's Alice, are part of the advanced air mobility market and will allow us to leverage the existing airport and airspace infrastructure in the

United States by increasing flights without increasing pollution or our carbon footprint.

First, we strongly encourage the FAA to look beyond the borders of the United States and to work with global regulators such as the EASA, the European Union, the Aviation Safety Agency, and Transport Canada across the border on the path toward certifying electric aircraft.

To make significant advancements and positive impact on the environment, electric aviation and sustainable aviation must be supported and adopted globally and quickly. Today's aviation—today, pardon me, aviation's fastest growing source—is the fastest growing source of greenhouse emissions worldwide.

By 2050, our share of climate impact is expected to be 25 to 50 percent if nothing is done. The sustainability challenge is not only one country's challenge. It is a global challenge, and the United States has the immediate opportunity to take the leadership role.

We must act with a sense of urgency to drive environmental progress, but also to push on global competitiveness and to remain out in front and attract economic opportunity and prosperity in terms of manufacturing and jobs here in the United States.

Second, it is important that the FAA focus on clear requirements for certification of battery technology, whether it pertains to an all electric or hybrid aircraft. Standard need to be applied the same internationally, but we can focus on mass adoption of electric aviation.

Global standard for battery technology will ensure that we stay focused on the greater task of reducing the environmental impact of aviation, while also increasing the commercial availability and economic and social benefits of aviation globally.

Third, we encourage the FAA to work with agencies from other departments, such as the Department of Energy, on the development of charging infrastructure and battery technology. The DOE is already leading ground, leading the world in terms of ground vehicle battery infrastructure with battery policies and initiatives.

The same approach could be applied to the aviation industry to ensure that technology development is aligned with certification requirements for all electric aircraft. Further, there is an opportunity to tie in the Department of Energy on the expansion of aircraft charging networks to service rural and urban airports across the country.

With the recent passing of bill S. 516, we believe there is clear direction to facilitate this engagement, and we look forward to working with this committee as you consider initiatives for the FAA reauthorization in 2023. Thank you very much for giving me this opportunity to testify today.

[The prepared statement of Mr. Davis follows:]

PREPARED STATEMENT OF GREGORY DAVIS, PRESIDENT AND CEO, EVIATION AIRCRAFT

My name is Gregory Davis and I am the President and CEO of Eviation Aircraft, a manufacturer of all-electric aircraft based in Arlington, Washington. We are manufacturing the world's first all-electric aircraft, integrating battery technology with electric propulsion.

Chair Sinema, Ranking Member Cruz, Chair Cantwell and Ranking Member Wicker, and members of the Subcommittee on Aviation Safety, Operations and Inno-

vation, thank you for the opportunity to testify on the policies and regulations needed to usher in the new era of sustainable aviation.

We are currently working towards the first flight of our zero-emission Alice commuter aircraft which will be a historic day and major milestone in electric aviation. Our goal is to show people what affordable, clean and sustainable aviation looks and sounds like for the first time in a fixed-wing, all-electric aircraft. It has taken deep collaboration across the aviation ecosystem to reach this point. It is my hope that one day this type of travel will be so prevalent in our society that we will not need to use the word “electric” to describe it.

Electric aviation has the power to transform communities across the country. Specifically, it can restore or provide essential air service to rural communities that are often underserved. Today, only 500 out of 5,000 airports are served by any commercial flights, despite 60 percent of the population being within 10 miles of an airport (active or not) and 95 percent being within 25 miles. We have already seen early market traction from forward thinking operators including Cape Air and GlobalX for passenger travel, and DHL for cargo.

Today, I am here to share my insights on key areas that must be prioritized in order to make electric aviation the standard for regional travel in the U.S and beyond. My comments will be addressed around the eCTOL—electric conventional takeoff and landing—market, while acknowledging my greater support for the advancement of all aspects of the sustainable aviation industry. eCTOLs, like Eviation’s Alice, are part of the Advanced Air Mobility market and will allow us to leverage the existing airport and airspace infrastructure in the United States by increasing flights without increasing our carbon footprint.

First, we strongly encourage the FAA to look beyond the borders of the U.S. and work with global regulators, such as the European Union Aviation Safety Agency (EASA), on the path towards certifying electric aircraft. To make a significant impact on the environment, electric aviation must be supported and adopted globally. Today, aviation is the fastest-growing source of greenhouse gas emissions. By 2050, its share of climate impact is expected to be 25–50 percent if nothing is done. The sustainability challenge is not one country’s challenge. It’s a global challenge and the United States has an immediate opportunity to take a leadership role. We must act with a sense of urgency to drive environmental progress but also global competitiveness and economic opportunity and jobs in the United States.

Second, it’s important that the FAA focus on clear requirements for certification of battery technology whether it pertains to all-electric or hybrid aircraft. Standards need to be applied the same internationally so that we can focus on mass adoption of electric aviation. Global standards for battery technology will ensure we stay focused on the greater task of reducing the environmental impact of aviation while also increasing the commercial availability and the economic and social benefits of aviation globally.

Third, we encourage the FAA to work with agencies from other Departments, such as the Department of Energy, on the development of charging infrastructure and battery technology. The DOE is already leading ground vehicle battery infrastructure with battery policies and incentives. The same approach could be applied to the aviation industry to ensure that technology development is aligned with certification requirements for all-electric aircraft.

Further there is an opportunity to tie in the DOE on the expansion of aircraft charging networks to service rural and urban airports across the country. With the recent passing of Bill S516, we believe there is clear direction to facilitate this engagement and we look forward to working with this Committee as you consider initiatives for FAA reauthorization in 2023.

I look forward to working with the Subcommittee in the areas I outlined today and our shared goals of making all-electric flight a reality in the U.S and beyond. Thank you for the opportunity to testify today.

Senator SINEMA. Well, thank you so much for joining us. And thank you all for your opening statements. Your written statements will be entered for the record. And now we will begin a round of questions for our witnesses.

I will first recognize myself for 5 minutes. Mr. Fymat, thank you again for being here today. Arizona is proud to be the home of Honeywell Aerospace, one of the world’s leading organizations in the AAM and UAS industry. Honeywell employs thousands of Arizonans in its locations throughout the state.

I had the privilege of visiting Honeywell's Deer Valley site in North Phoenix earlier this year and participating in a town hall with Honeywell employees to answer their questions about the state of our Nation's aviation sector.

Honeywell hosted a summit here in Washington last week on AAM and UAS issues where many industry leaders participated. What key findings and recommendations from that summit can you share with Congress as we reauthorize the FAA?

Mr. FYMAT. Thank you, Chair Sinema. So yes, indeed, we did host an Advanced Aero Mobility Summit last week. We had over 250 people that attended, including Government regulators, industry trade associations, vehicle manufacturers, including companies like Lillium, Textron, Vertical Aerospace, and Archer. And indeed, there were insights, takeaways, and findings that came out of that.

I think that it is not just Honeywell saying this, we have all heard it here today, and we heard it at our summit loud and clear, that we have a choice here to make. Great countries have great transportation systems. And the feeling that came out of that was that, you know, we may need so far as to have a mandate from the very top of Government that we will be a leader here, you know, much like in the 60s where we chose to go to the Moon.

Number two, this will need a whole of Government approach. There are many stakeholders here. It is not just the FAA. It is local Governments, State Government, associations, industry, and communities, and it requires a whole Government approach in order for this to succeed for our communities.

Number three, U.S. leadership does not mean going it alone. We had a lot of international representation at our summit last week, and so the FAA should reach out and work with the other agencies on different countries, you know, in Europe, Australia, Japan, and South Korea. All of them are also tackling the same issues that we are.

And by working together, we can come up with a set of regulations and frameworks that work not just in the United States, but that work across the world. This is important for everyone. It is especially important for the U.S. companies that are working in this area to ensure that they have global access into global markets.

Number four, there is a lot of low hanging fruit in AAM, and we have heard about it today, whether it is things like transportation to offshore energy platforms or over sparsely populated areas, delivering critical supplies to disaster areas, wildfire fighting, pipeline inspections, drone inspection of critical structure in general.

All of these are sparsely populated environments with a very—where you can still have very high benefits. There is no reason we can't do immediate action in these areas. And then last, we industry also have our job to do. We have to continue to educate consumers, citizens, Government, and industry so that people really know what it is and what it isn't.

There was a phrase last week, you know, the void will be filled, let it be filled with the correct information so that we make the right decisions. These are the sorts of things that came out of our summit last week. Thank you.

Senator SINEMA. Thank you. And Mr. Bolen, the House and the Senate have passed my and Senator Moran's AAM bill, the Ad-

vanced Air Mobility Coordination Leadership Act, which will establish an interagency working group to review policies and develop programs to aid in the development—in the deployment of AAM technology and identify the safety, security, and infrastructure investments required for the development of AAM.

I appreciate NBAA support for our AAM leadership legislation. Could you talk about why NBAA supports the legislation and why it is so important to harness the expertise from across the Federal Government to safely and effectively deploy AAM technology?

Mr. BOLEN. Well, thank you, Chair Sinema, and thank you for your leadership on the bill itself. This is—should be a national priority, something worthy of galvanizing our Government to move forward. As we said before, the benefits are enormous. But what we have seen is as a country, we do best when we have clear goals.

This is what we want to achieve. So bringing together, as it was touched on, the Department of Energy, the Department of Transportation, finding ways to tap into some of the things that we are committed to.

When we passed the bipartisan infrastructure bill, we talked about the importance of electrification of vehicles, will we be able to use that same type of approach when we are making changes to our grid to also make that available to airports and make sure that aviation is able to tap into it.

Those are some of the examples of how we need to collectively come together to recognize that what we are trying to do here can enhance sustainability, accessibility, affordability of air mobility and give us a chance to do some of those things we are talking about. You know, a lot of the things we have talked about, we have used numbers, we have used facts. Just to put a face behind some of this.

When we had Katrina hit New Orleans, we relied on our general aviation community, used those airports when Louis Armstrong was flooded to bring to stage relief efforts. We can do the same with advanced air mobility, particularly as we are thinking about Hurricane Ian today. We can move organs for transplant.

We even have one of the AAM companies that was specifically designed to move organ transplants. The benefits are very real, but it takes a collective effort, and that is why this needs to be a national imperative and worthy of collaboration and communication across all of our various agencies and across all sides and aisles of Capitol Hill.

Senator SINEMA. Thank you. I now recognize Ranking Member Cruz for 5 minutes of questions.

Senator CRUZ. Thank you, Madam Chair. As I said in my opening statement, I have serious concerns that U.S. leadership is falling behind in aviation.

As we continue to move forward with emerging technologies like unmanned aircraft systems and other advanced air mobility systems, I have serious doubts about how long it will take the FAA to provide the regulatory certainty that these companies need. You all represent the regulated industry, and you all have to deal with the FAA in some way, shape, or form. So I want to get a better understanding as a practical matter from each of you.

From each of your perspectives, what seems to be the problems, and why aren't we moving faster on fostering the growth of these new entrants, on integrating them into the national airspace, and is it a lack of resources or funds at the FAA? Is it a leadership problem? Is it—what is causing the uncertainty? And I would like each of you to address this. Ms. Ellman.

Ms. ELLMAN. Sure. Thank you for that very important question, Senator Cruz. In our experience—first, let me start like, so the technology is moving much more quickly than the policy. The challenges that the FAA is facing are systemic.

I will say the folks, the individuals that I have worked with at the FAA are hardworking, you know, well-intentioned individual staffers that are trying to do what they can to integrate UAS into national airspace.

The reality is it is like fitting a square peg into a round hole. It just doesn't fit. They are using, you know, incongruous regulations designed for a crewed aircraft and trying to fit UAS commercial drones into this regulatory framework that simply doesn't fit.

From our perspective, you know, there have been lots of—there have been some proposals out there about—even the FAA has recognized that there is a lack of organization or a lack of leadership on this topic. And we have seen some proposals coming from the Administration.

We appreciate that we agree that the status quo is broken. From our perspective, we need to see responsibility and authority aligned. We need to have a leadership office. We have been talking, several of our witnesses have talked about the need for a national vision and a national strategy.

Certainly China and other countries are developing their own national strategies and moving ahead with this tech—in this technology. We need to do the same here at home. It is critical for our global competitiveness. And the way to do that is by actually aligning responsibility with authority within the agency so that one office has the authority to actually sign off on waivers, exemptions, approvals.

Right now, if you want to do research and development, it can take 2 years to get a one site specific approval to just to do R&D here in the U.S. It is simply not sustainable. So we need the certainty, we need the transparency, but above all, we really need the leadership.

And I am happy—we have our own proposal on this, and I am happy to follow up with you and your staff about it as well.

Senator CRUZ. Yes, I would welcome it and that is helpful. I have heard similar concerns from other stakeholders that it is hard to know to whom you go to even get an answer.

Ms. ELLMAN. Exactly.

Senator CRUZ. Colonel Luxion.

Mr. LUXION. Yes, Senator—I am going to almost restate some of what was just said. You are right on the, when we work with industry to try to identify what requirements and what needs to be done within FAA, many times they do not know who has the responsibility and the authority across the whole gamut of what that industry is trying to do to get it accomplished.

So there is a structural issue that needs to be addressed. And it can't be put in very low levels of the FAA, it has to be raised to a priority level that can drive across the FAA some level of, hey, let's get on board and move this thing forward. The—and what the other issue, the other thing I brought up in my opening statement is, OK, once we get the structural place in some place with responsibility, what is the path forward?

What is the regulatory gaps? What is missing in regulation? And lay it out from all aspects of what industry and first responders, public safety is trying to accomplish. Without that, we are just going to continue to—everything is going to be a one off.

And as my colleague Lisa, good friend said, the folks inside the FAA that we work with day in and day out are trying and they are working very, very hard but they run into these barriers throughout the whole process.

Senator CRUZ. Mr. Fymat.

Mr. FYMAT. So I will add two points to your question here. Number one is deadlines. Nothing gets done without a schedule, goals, and deadlines. And some of what happens here happens without deadlines. And so will we have a AAM certification act in 2024—or regulation until 2024? Will we have it later? If we put in deadlines and hold an organization accountable to those deadlines, things tend to get done. So that is the first thing I would say.

The second thing that I would say is mindset, mindset of safety mandate versus innovation. There seems to be sometimes a well, in order to fulfill our safety mandate, we have to take our time to make sure we get this right, as if somehow innovation is a threat to safety. But in fact, what we have seen time and again is that innovation leads to safety.

Historically, we have seen this with synthetic vision systems, terrain warning systems, weather radar, all of which were innovations that led to increased safety. And in fact, we don't have to do safety or innovation. It can be safety and innovation, innovation that drives safety.

So, for example, as we are sitting here today, there is a hurricane going on in Florida and drones could have a lot to do with improving the safety and the recovery from that hurricane. So those are the two things.

Deadlines and accountings of deadlines. And number two is safety mindset, and innovation can lead to safety and is not a threat to safety. Thank you.

Senator CRUZ. Mr. Bolen.

Mr. BOLEN. Yes. Coordination and communication is key. As you know, the FAA has different lines of business, air traffic organization, airports, certification, safety. All of these need to be coordinated and communicating with each other. That doesn't happen without direction and purpose. They need to be very intentional.

I also want to underscore what has just been said about deadlines. It was brought up earlier that the FAA will now use an approach that requires a special—a special Federal aviation rule, regulation in order to move forward. The expectation is that that will be done in 2 years. It is important that we stick to that time-frame and that we work backward trying to determine what needs to be done.

We also need to recognize that the FAA's approach, and one that the industry largely supports, is a crawl, walk, run approach. We are going to start with what we know, and we are going to iterate, we are going to evolve, we are going to adapt as new technologies and new operations come forward.

We have got to make sure that it is, in fact, an iterative process. Just this week, we had a new design, engineering brief for vertiports, really critical as we are moving forward to a new vertiports AC hopefully within 2 years. But we have got to start conservative but build out, iterate, and get to the promise of advanced air mobility.

Senator CRUZ. And Mr. Davis.

Mr. DAVIS. The air mobility market—[technical problems]—subset of the advanced air mobility market. A common certification standards for aircraft battery technology that allows us to commercialize our product and bring it to market around the world is a key thing that we would need from the FAA.

Senator CRUZ. OK. Thank you.

Ms. ELLMAN. Thank you. I now recognize Senator Rosen, who is joining from her office. Senator Rosen. Oh, Senator Rosen, we are not able to hear you. We still aren't able to hear you, Senator Rosen. Senator Rosen, do you have a few minutes to have someone help you technically? OK. I am going to go to Senator Moran and then we will be right back to you, Senator Rosen. Thanks.

**STATEMENT OF HON. JERRY MORAN,  
U.S. SENATOR FROM KANSAS**

Senator MORAN. Madam Chairwoman, thank you very much. And I thank our panelists here, and by technology, for their presence today on a very significant and important topic for the future of our country's well-being. Let me start with—just I have a couple of questions is all but let me start with Ms. Ellman.

During your testimony, you mentioned the future role that this technology could play in supporting the agricultural sector. Can you further comment on the importance of merging these two industries, businesses?

Ms. ELLMAN. Absolutely. So there are so many use cases, including precision agriculture, where the UAS industry is just bringing so many efficiencies to enterprise. And agriculture is one, we are seeing so much growth in that specific vertical market sector. So drones can be used for everything, from what are traditionally very dangerous crops spraying aerial agricultural, spraying jobs.

As I noted in my testimony just in 2020, there were 13 aerial agricultural deaths, including in your home State of Kansas, and 54 accidents. And this is something that drones—you know, these deaths don't have to happen.

Drones can do the job just as well, as well as inspecting crops and performing other, you know, critical precision agriculture as our population continues to grow and, you know, farmers are under increasing pressures to be efficient. Drones add efficiencies, add safety, and make agriculture so much more efficient and safe.

Senator MORAN. I thank you for that answer. And as a state, Kansas is a significant aviation and aerospace component of our economy, and it is certainly not the same when it comes to agri-

culture, and I love the opportunity to see the opportunities we have in our state to advance both really in the same effort, same time-frame.

So, thank you. Mr. Bolen, on Monday, the FAA released new design guidelines for a vertiports infrastructure that will support advanced air mobility aircraft. Could you give the Subcommittee some insight into what the NBAA and industry leaders are doing to focus on the infrastructure side to support these new aviation entrants going forward?

Mr. BOLEN. I would be happy to. And again, thank you, Senator, for your leadership on the Advanced Infrastructure Modernization Act. That is a very important part of moving forward. Obviously, we have, as we have discussed, an incredible airport infrastructure in the United States, 5,000 public use airports.

But when we look at the potential for advanced air mobility, we see the opportunity to move to vertiports starting at airports, but also moving to parking lots, city buildings, and other types of operations. We have looked to the FAA for an engineering brief to allow us to begin moving forward with the vertiport standards.

We did have an opportunity as a community to provide comments on that. What we saw on the engineering brief that was released on Monday is many of those comments were recognized.

But the FAA is taking a very conservative approach with the idea that as we move to the Altman vertiport advisory circular, we will iterate, we will begin understanding operations and technologies and we will be able to ultimately have a vertiport infrastructure that is able to adapt and evolve with technologies and operations.

We now have a place to start, and it is a great beginning, but we have to evolve it and adapt it. So we are looking at this as the first step in an important iteration and that is a key part of the infrastructure as we go forward.

Senator MORAN. Thank you, Mr. Bolen. And Senator Sinema, thank you for your assistance, our working together on this piece of legislation, and particularly your help in making sure that it received time on the Senate floor. Thank you to both you and Senator Cruz for today's hearing.

Senator SINEMA. Thank you, Senator Moran. Senator Rosen let's give it another shot.

**STATEMENT OF HON. JACKY ROSEN,  
U.S. SENATOR FROM NEVADA**

Senator ROSEN. Well, can you hear me now, as the famous line goes?

Senator SINEMA. Yes, Senator Rosen, we can hear you and you are now recognized for 5 minutes.

Senator ROSEN. Thank you. I appreciate it, Chairwoman Sinema Thank you, Ranking Member Cruz. This hearing is really important. I appreciate witnesses being here today.

One of the things I have been worried about is protecting stadiums from drones because Nevada, you know, we are at the forefront of the UAS technologies and our state, our UAS test site at the University of Nevada Reno is leading the way in autonomous vehicle testing and robotics research, and we have been designated

by the FAA to serve as a center for the development and testing of unmanned autonomous vehicles operating beyond vision—visual line of sight, excuse me.

We are also, of course, home to the entertainment capital of the world, Las Vegas, which is quickly emerging as the sports capital of the world as well. I am going to give a shout out to the WNBA champions, Aces, this past few weeks, and of course, Formula One racing coming next year. And according to the Las Vegas Review-Journal, we are also the first city to have secured the NFL draft, Pro Bowl, and the Super Bowl at our new Allegiant Stadium, home to the Las Vegas Raiders.

Unfortunately, this stadium, like so many others across the country, is a potential target for drone attacks by bad actors. So, Ms. Ellman, as we make UAS policy decisions, how can we promote continued innovation and advancement in drones while protecting critical infrastructure like stadiums from evolving threats?

And Mr. Fymat, I understand your company has some experience in the area, so perhaps you might answer after Ms. Ellman, please.

Ms. ELLMAN. Sure. Thank you very much, Senator Rosen, for that very important question. And thanks for your—Nevada's leadership on all things sports. Absolutely. It is a critical issue. Let me just start by saying, you know, obviously, most drone operators are compliant, responsible, abiding by the laws. But of course, all technologies can be used for good and for bad and drones are no different.

Drones can also be used for harm. Just like the UAS use set of regulations has really lagged behind the evolution—the emerging technologies, so have the current drone, or drone security set of laws and regulations.

And because of that, we have been, the Commercial Drone Alliance is on the record supporting Senator Peters' legislation on counter UAS. We support the extension of the Preventing Emerging Threats Act, which expires next week, October 5th.

It would also enhance detection authorities. It would also set up a limited counter UAS pilot program with strong Federal oversight and training. We really see innovation and security as two sides of the same coin. You can't have one without the other. So we, you know, and I know stadiums as well are looking to incorporate drones into their own operations. So we 100 percent agree that it is a very important issue.

And, you know, look forward to working with you and your staff on the legislation that is out there and other good ideas as well.

Senator ROSEN. And Mr. Fymat, if you quickly answer. Then I have some other questions on drones and infrastructure to go back to both of you as well.

Mr. FYMAT. Right. Thank you. And I think to add to my colleague Lisa's answers, I think that in the world of drones, all drones are identified, whether it is remote ID or other technologies like that that make them conspicuous. So I think that is very important to do. Most cybersecurity issues always fall down into the areas of either technology or the people using the technology.

On the technology side, we need to ensure that drones—you know, the cybersecurity is built into the technology that goes onto the drones, much as what we do when we build cybersecurity and

everything into the avionics systems and others that we make for larger aircraft. I think that those principles have to continue all the way through. Thank you.

Senator ROSEN. Thank you. And I want to move on and continue to talk about drones as they relate to infrastructure, because whether we have—getting drones to do our deliveries, photography and everything in between, drones have really proven helpful across a range of industries, including infrastructure, construction, and inspections because drones offer contractors and engineers a really efficient and agile way to use this technology to gather data.

They can go in and around bridges, in and around small places in infrastructure. This can help minimize accidents and find issues early.

And Ms. Ellman, I really thank you for recognizing my recently introduced bill, the Drone Infrastructure Inspection Grant Act, and it is bipartisan legislation creating grants for local, State, tribal Governments to use drone technology to be their eyes and visually inspect infrastructure and train employees how to properly, excuse me, use them.

So we have invested significantly with the bipartisan infrastructure law to repair and update our Nation's infrastructure. So, Ms. Ellman and then Colonel Lux, with the backlog of inspections, we know drones can speed up the process. What do you think we need to do to get the workforce and the drone force, if you will, up to speed?

I know I am just about the end of my time, but it is critically important we can use this, and we can save lives, I believe, by doing that maintenance faster. Ms. Ellman, you can go first, then Colonel Lux.

Ms. ELLMAN. Yes. Sure. Absolutely. And thank you, Senator Rosen. And thank you for your leadership and Senator Blumenthal and Senator Boozman for introducing the DIG Act in the Senate. It is bipartisan legislation. We are strongly supporting it. As you mentioned, there is a backlog of critical infrastructure inspection. Drones can certainly help clear that backlog more efficiently and more safely.

The DIG Act, I think, is a first start in terms of how do you move all this forward by investing funds in moving, you know, both in the workforce of tomorrow and as well as in the enabling states and localities to actually invest in the technology themselves.

So we are strongly supportive of it. I think the next—we also need to look at the rules, however, because many of these long linear infrastructures require flights beyond visual line of sight, for example, and there is still no broad rulemaking that enables that here in the United States.

So really, in order to move this forward long term and to be able to scale these operations, we also need to implement the beyond visual line of sight aviation rulemaking committee recommendations as well.

Senator ROSEN. Thank you.

Mr. LUXION. Senator Rosen, thank you. Thank you for the support on that bill. So the regulation needs study on how to get these things in place. And the good news story is we are already working on, the FAA has tasked Assure to look at areas of—called shielding

and right away rules to support beyond visual line of sight operations in these types of inspections in the future. So already efforts are moving forward at least within the FAA to start getting this to happen.

Senator ROSEN. Thank you. I appreciate it. I am going to take just 1 second of personal preference. My late father in law, who I loved dearly, was a bridge inspector for the City of Los Angeles for over 50 years. He would have been so excited to use these drones as he would have done his work. So I think about him today and the technology that we are going to use to continue to work on this. Thank you, Madam Chair.

Senator SINEMA. Thank you, Senator Rosen. Senator Thune, you are recognized for your 5 minutes.

**STATEMENT OF HON. JOHN THUNE,  
U.S. SENATOR FROM SOUTH DAKOTA**

Senator THUNE. Thank you, Madam Chair. And I will just say that the title came to the Las Vegas Aces after they hired a South Dakota native, Becky Hammon, to be their coach, so.

Senator ROSEN. Oh, well, we appreciate it. Thank you. Thank you for bringing her to—thank you for letting us have her. But we are going to keep her, if you don't mind, Senator Thune.

[Laughter.]

Senator THUNE. It is OK. Yes, I don't blame you. During my time as Chairman of this Committee, we considered and enacted the FAA Reauthorization Act of 2018, which included substantial new authorities for the FAA to modernize the national airspace system and better accommodate new entrants.

And since that time, the agency has moved forward with several significant actions, including rules governing remote identification and operations at night or over people for unmanned aircraft systems.

However, significant work remains to ensure that the UAS and other entrants are fully integrated into the NAS, including a generalized process for type certification of UAS and advanced air mobility aircraft, a consistent regulatory framework for beyond visual line of sight operations for UAS, and clear rules to ensure the safe interaction of these new entrants with manned aircraft.

As this committee begins consideration of the next FAA reauthorization, I look forward to these conversations and appreciate hearing from you all today. Ms. Ellman, in April of this year, I sent a letter with Senator Warner to Acting Administrator Nolan requesting information on the FAA's progress in establishing generalized standards for UAS type certification.

I believe the development of these standards will ensure that UAS conducting complex operations in the NAS will deliver clear commercial and societal benefits and keep the United States at the forefront of safety innovation. Do you believe that developing generalized standards for UAS type certification is an important component of advancing UAS integration?

Ms. ELLMAN. Senator, Senator Thune, thank you so much for that question. Absolutely. We very much agree. The type certification process—as we have been talking all about the benefits of commercial drones, but really to take advantage of those benefits

of commercial drones, we need to be able to scale expanded drone operations. And one path to do that is through type certification.

And to date, we have had, you know, we have had several drone manufacturers working for several years, hand-in-hand closely with the FAA trying to get type certification. We have had in some good news a few weeks ago, Matternet was the first company to actually get their type certification approved by the FAA.

Now that there has been one company that has been approved, we very much hope to see many others, who have been working with the FAA for several years on this process, approvals come quickly. But we also believe that now is a good time to think about how to streamline and improve this process, which the durability and reliability process was meant to take 6 months. It is not well designed.

You know, 4 years and 4 months later, I believe, is how long it took Matternet to get their type certification. By that time, how many new iterations of the vehicle. The technology is moving so quickly forward. We need a process that is designed and tailored for this new industry, which is designed differently.

And so we very much appreciate your leadership on that. We have our own reform proposals and ideas that we would be very excited to sit down with you and your staff and discuss.

Senator THUNE. OK. Mr. Bolen, in your testimony, you also described challenges with the current type certification process for AAM aircraft. Do you believe the development of generalized standards would also be useful in fostering the integration of AAM aircraft into NAS?

Mr. BOLEN. Yes, absolutely as well. You know, we talked about the importance of predictability and certainty, and there is an enormous amount of investment being made to try to bring these products to the market.

Understanding a clear pathway to a type certificate, production certificate, op-specs, being able to begin the operations. It is very important for us to know what to expect as we prepare. So the clearer the path, the better opportunity we have to arrive at our destination.

Senator THUNE. Thank you. Colonel Luxion, I remain very interested in ways to improve automated aspects of air traffic management, especially as the NAS becomes more crowded. This includes a bill, the Dynamic Airspace Pilot Program Act, which I have introduced along with the Chair, Senator Sinema, to improve dynamic management of the NAS.

What can this committee do to build on the work that FAA is doing to improve these automation tools and reduce the burden of increased traffic on controllers, and adopt concepts such as adaptive airspace or dynamic airspace?

Mr. LUXION. Thank you, Senator Thune, for that question. The FAA—NASA has really done groundbreaking effort and work in this area to move it forward. We need to create a bridge from that NASA work into the actual regulatory requirements. How do you change all the technologies and all the questions or answers that NASA has provided into a regulatory structure at least below 500 feet to provide that?

This—UTM is critical. Absolutely going to be the backbone to deal with all the increased activity and small UAS. They are going to operate beyond visual line of sight below that 500 feet or 400 feet and below. I would say that needs to be part of the reauthorization act to establish the regulatory framework to support UTM going forward.

Senator THUNE. Yes. And hopefully it will be part of the reauthorization act. Thank you, Madam Chair.

Senator SINEMA. Thank you, Senator Thune. I recognize Senator, Chair Cantwell for 5 minutes next.

The CHAIR. Thank you. Mr. Davis, I want to congratulate you again on yesterday and the flight of Alice. It is very exciting news in the aviation model as you made comment to earlier. This was no small achievement, and I know that the work has been ongoing by you and many others.

So, again, congratulations on your efforts to decarbonize aviation and have electric planes. I wanted to follow up on your comments and maybe tie in Mr. Bolen as well. When we look at essential air service and we look at some of our challenges in transportation, I understand your current plans, or the idea was originally for a 2027 date.

And that is you already have commitments from Cape Air, a regional carrier, and DHL for cargo. What steps does Congress need to take to continue to look at this issue you brought up of coordination between the FAA and DOE on battery standardization?

Mr. DAVIS. Well, thank you very much, Chair Cantwell. And, again, thank you for the kind welcome. It was a very exciting day. I am actually here at our flight test facility—the air tech flight test facility in Moses Lake right now, not very far from where we flew. There are many aspects to what we are doing here with the electric aircraft that play into the broader discussion, as well as the specific infrastructure requirements.

We talked about the walk, fall, crawl, run methodology that we have generally accepted in aviation. It certainly doesn't feel like a crawl or a walk with what we are doing right now. But what we are doing is an important steppingstone to actually bringing electrified aviation to the marketplace.

We are choosing the path of taking an electric conventional take-off and landing airplane and developing that for electric propulsion and battery power. What that allows us to do is to leverage the existing airspace requirement. So we take off from an airport, we fly in airspace, and we land at an airport. It allows us to focus on the technology development.

The FAA discussion we had before about, you know, aiding in the certification of batteries, making sure that we are using advanced technology as quickly and as safely as possible to enable the emission profiles that we are looking for. Those—right now essentially air service routes that are typically less than 250 nautical miles, you know, or less than 300 statute miles.

And then also adopting the advanced operating technology for the aircraft to allow for single pilot operations, which is again on the pathway to full autonomous operation for cargo and eventually passenger operations. With respect to the DOE and potentially

DOT and FAA, what we need to do is to look at the establishment of the charging infrastructure.

The good news, compared to say the broader automotive charging infrastructure, is whether it is the 2,000 airports that have had some service or very near large urban centers or the broader 5,000 airports. In aviation, unlike in a car—in a car, you want to be able to go wherever you want to go, when you want to go there.

In aviation, we tend to want to take off exactly when we meant to, go exactly where we wanted to, and land exactly where we wanted to, all on schedule. So it becomes much easier, especially in the central air service map, to develop that infrastructure.

What we are looking at doing and with those customers that you have identified, in particular with Cape Air, is building out a proof network showing that we can actually operate in a subset and then scaling it from there.

And that is where certainly interaction between the FAA on the airport side and on the aircraft charging interface, and DOE in terms of overall battery technology will benefit the industry.

The CHAIR. And what about DHL, though, when you are talking about cargo, because obviously you are talking about a marketplace of whatever, 9 passengers or something like that. What—when you are talking about cargo, what is the profile there?

Mr. DAVIS. So thank you for that. The cargo missions are going to be very similar. So again, it is that last 100 miles of delivery. It is taking out, you know, two or 3 hours of delivery time for the packages that we want to see arriving. Again, though, it is going to be point to point for the initial deployment of the aircraft.

We will know where the aircraft are intended to go. I mean, we as an industry will know specifically which airports they will be operating from. So we need to start there and then help buildup the infrastructure.

The CHAIR. Well, this to me, it seems like a game changer when I think about some of our problems, you know, with—particularly with the airlines and, you know, even with the expansion of Paine Field, you know, and people are happy to have, you know, flights to Palm Springs and Hawaii and various places.

I have heard a lot of people wanted flights to Spokane. So the notion that Walla Walla, that is constantly short changed, you know, very big and growing wine region of our country, but one flight a day or two flights a day, and you could change that. And you could have people going, you know, five or six flights a day.

Now it is all economical. So you are changing the dynamics of a rural economy and that could be very interesting solution for driving efficiencies into the marketplace.

Mr. DAVIS. Yes. Thank you for that. That is certainly with the aircraft that we are developing and this being the first entrance into the sector, you will immediately be able to actually produce less emissions on that same duration of trip than you would in a car. There is literally no tailpipe on the aircraft.

So the emissions that we produce are during the production of the aircraft, and then from the power that is derived from the energy grid, wherever you are operating the aircraft. There is plenty of opportunity to make that better. One of the—again, I thank you

very much for your words about the changing the industry, changing the world.

That is exactly how we see it. It is a very easy game to play, to think, you know, where are you right now? And could you find nine people or eight other people who wanted to go, you know, 200 or 300 miles away right now?

And, you know, from Moses Lake to Walla Walla or to Paine Field, as you have just said, those are routes that we will be able to do as the aircraft enters into service. So certainly—the application and the capability of the technology that goes into the aircraft will allow those routes to expand and only further improve our capability to transform regional air travel.

The CHAIR. And I see my time is expired, Madam Chair, but one—your testimony references the fastest growing emission increase. Is that because of the global demand in aviation? Is that what—where you are getting that?

Mr. DAVIS. Yes, thank you for that. So absolutely. It is very important for us to recognize aviation in particular is a global business. You know, it is well said that airplanes tend to get around.

So again, this actually does present the commercial opportunity that we have to take the leadership role again in driving standardization of certification requirements. Right now, again speaking for aviation, we truly feel that we are in a leadership position, that we are ahead of certifying and bringing in aircraft to market that can fulfill these mission roles. And so this is a global problem.

Those emissions are global emission projections. No one country can do this on its own. That needs to be done by everybody. And so by working together and establishing common standards that will remove barriers to bringing product to market, which will further our ability to impact positively change sooner.

The CHAIR. Thank you. Thank you, Madam Chair.

Senator SINEMA. Thank you. Chair Cantwell. Senator Lee, you recognized for 5 minutes of questions.

**STATEMENT OF HON. MIKE LEE,  
U.S. SENATOR FROM UTAH**

Senator LEE. Thank you, Madam Chair. Ms. Ellman, I would like to start with you, if that is OK. I have long been concerned about the FAA's regulatory processes and the fact that they are not keeping pace with modern technology. From supersonic aircraft to launch and reentry for space vehicles, it is a slow process that is hindering technology, or it is not allowing technology to proceed.

But your testimony highlighted how this isn't limited to space vehicles and supersonics. It covers areas, other areas as well, like drone regulations are also being held back by the FAA's current processes. Now, you noted that the GAO and the DOT Inspector General, as well as the National Academy of Sciences, have chimed—they have weighed in on this, and they have referred to the FAA's lack of progress in this area, as I think the word they used was indefensible.

Now, I completely agree. I would call it and I do call it indefensible. And I think Congress should address this in next year's FAA legislation. The part 135 process to me seems expensive and something that probably wasn't intended for drones. Absolutely, cer-

tainly wasn't intended for drones. Not designed for drones, not well-suited for drones.

What do you think about this? Do you think the part 135 and the process that is involved in it, do you think that makes sense for drone carriage, and should we consider a drone specific carriage process that reflects drone realities?

Ms. ELLMAN. Thank you for that very important question, Senator Lee. I would—yes, absolutely. There is, I remarked earlier, part of the challenge here, the technology has moved so much more quickly than the policies. And we are, you know, essentially the FAA is attempting to fit a square peg into a round hole.

Regulations that were designed for the crewed aviation industry directly to drone use, which don't have people on board very, very, very different in some ways, you know, closer to kind of like, you know, what looks like a cell phone versus a 737. So, absolutely, we need new rules that are drone specific.

The beyond visual line of sight aviation rulemaking committee considered exactly this and looked at from a regulatory perspective, provided recommendations to the FAA on how in a risk based, performance based way, the FAA could broadly enable scaled commercial delivery operations.

And I think that provides a framework and—for the FAA to use that we would like to see implemented expeditiously. It touches on airworthiness, it touches on airspace, it touches on crew and operator qualifications.

It gives, essentially provides a road map to the FAA on how bringing all, you know, relevant stakeholders together, industry working together with academia and States, localities, and others to craft these recommendations, how we can do that in a way that enables us to take advantage of the benefits of commercial drones.

Senator LEE. No, I think that is right. And it is sad that the one thing holding us back, because all the players you have mentioned are ready, willing, eager, able to do this, is the regulatory chokehold and the fact that they are stuck in this Byzantine labyrinth of the 135 process, that makes absolutely no sense here. It drives me crazy.

There are quality of life issues. There are public safety issues. There are environmental issues that could all be addressed favorably, relieved significantly by drone delivery. And yet the FAA leaves us stuck in the stone age on this, and that is unacceptable. I am also concerned that we risk further delays to the effective integration of drones if we don't answer some of the outstanding key questions regarding the scope of Federal preemption and the role of State and local Governments.

For example, the National Conference of State Legislatures, NCSL, has raised some of these questions specifically, and I am quoting here, "does the FAA have the authority to regulate all drone operations, including low altitude operations? How will property rights and nuisance claims in area of law traditionally within State local police powers be impacted by drones, low altitude operations?"

And what is the scope of civil and criminal trespass authority in low altitude airspace? The GAO, addressing some of these topics in a 2020 report, concluded as follows, "the legal uncertainty sur-

rounding these, and other issues is presenting challenges to integration of UAS into the national airspace system.

Successful integration may involve balancing the social and economic benefits anticipated from U.S. operations with Constitutionally protected property and privacy rights. It may also involve balancing the Federal Government's Constitutional rights and responsibilities to regulate interstate commerce with the State's Constitutionally reserved police powers and principles of federalism."

Ms. Ellman, do you agree with the GAO's assessment here that the successful integration will likely require balancing of these State and local interests?

Ms. ELLMAN. Absolutely. I mean, I so, yes, and thank you for that question, Senator Lee. States and localities have an incredibly important role to play in UAS integration. And I would point to successful programs such as the Integration Pilot Program and the Beyond Program as examples where industry works closely—has been and is continuing to work closely with States and localities to move innovation forward together with the Federal Government.

From our perspective, it is important that safety remains kind of—the FAA speaks with one voice there. If there is a patchwork quilt of regulations, it would be very difficult for companies to scale. And we are, you know, we want to be able to scale in a way that the industry grows and are able to take advantage of all of these benefits.

But that said, of course, States and localities have a critical role to play. I would also point to section 2209 of the 2016 Extension Act for means not yet implemented by the FAA. And that section would give—that provision would give—gives the FAA the authority to establish fixed site facilities, private entities to essentially declare themselves no drone zones, limit or prohibit drone flights over their own property, which would take care of a lot of those concerns.

So we would ask the FAA to expeditiously implement 2209, and we would be very excited to work with you and your staff. And, you know, many of our members are doing lots of outreach in their communities. I would point, for example, one of our board members, Zipline is working on, you know, back to school and doing lots of stuff in their communities. And that is true across the board.

It is absolutely critical that we have a great working relationship in towns and communities where we operate.

Senator LEE. OK. So that—we still do need to know the scope of preemption. We need to know the nature and extent of the limits on Federal authority here.

A lot of these programs weren't designed with an appreciation for on the ground realities that are specific to drones that are very different—you know, we are not in the realm of *Unites States v. Cosby* anymore, which contemplates traditional aircraft, you know, airplanes, fixed wing, sometimes rotary wing, aircraft involving the carrying of humans in addition to any other cargo. This is very, very different.

A drone, which can fly down to inches above the blades of grass on somebody's lawn, can fly right up to and against, in theory, into somebody's window, it presents some things that are very obviously within the domain of State and local authority.

Nuisance law, laws prohibiting voyeurism, things like that are all necessarily within the police powers of a State or locality. If we can't get this right, if we can't grasp what it is that is the nature and extent of the FAA's authority, where it preempts while acknowledging that it can't preempt all things, if we don't get that ironed out quickly, we are going to be in bad shape.

Ms. ELLMAN. We would welcome the opportunity to work with you and your staff on this very complex topic, absolutely.

Senator LEE. You will help us get there? You would be willing to help us delineate the—where those limits should be?

Ms. ELLMAN. We are happy to help, yes.

Senator LEE. Thank you. Thank you, Madam Chair.

Senator SINEMA. Thank you, Senator Lee. And with that, we have reached the end of today's hearing. Thank you to all of the witnesses for your time and testimony. The hearing record will remain open for 4 weeks until October 26 of 2022.

Any Senators who would like to submit questions for the record should do so two weeks from now, by October 12, 2022. I ask that witness responses be returned to the Committee by October 26 of 2022. That concludes today's hearing.

[Whereupon, at 4:04 p.m., the hearing was adjourned.]

## A P P E N D I X

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO  
LISA ELLMAN

*Beyond Visual Line of Sight (BVLOS) Rulemaking.* The UAS industry is well-positioned and evolving quickly to enable beyond the visual line-of-sight (BVLOS) operations, but regulatory frameworks struggle to keep pace. The FAA has accelerated efforts to integrate routine BVLOS operations by convening the BVLOS Aviation Rulemaking Committee (ARC) in 2021, and its final report and recommendations were published by the FAA on March 10, 2022.

To make progress on efficiently and safely integrating UAS operators into the NAS, the FAA will need to take action on the recommendations developed and submitted by the ARC by issuing a proposed rule. Congress included language in the FY 2022 appropriations bill directing the FAA to finalize a rulemaking on BVLOS by September 2023. However, the process of developing a final rule can take months, even years, to complete.

*Question 1.* In your view, what will be the impact to the U.S. drone industry and its ability to compete with other drone manufacturers in the global economy if the FAA does not meet the September 2023 deadline?

Answer. There are significant opportunity costs associated with inaction on the BVLOS rulemaking. Broadly enabling UAS flights BVLOS in a safe and secure manner is critical to unlocking the safety, security, equity, and sustainability benefits of using drones for many commercial and public safety tasks. The longer we wait to integrate advanced operations, the more we miss out on those benefits—from saving lives and avoiding workplace injuries to reducing traffic congestion and curbing emissions. The BVLOS ARC recommended a common-sense risk-based and performance-based approach to safely integrating BVLOS operations into the NAS, and delays in the BVLOS rulemaking will undermine the U.S. drone industry and American leadership in advanced aviation more broadly.

The current regulatory framework in the United States prevents scalable UAS operations and limits the integration of UAS into the NAS, and many countries around the world have taken significant steps to enable BVLOS operations beyond what is currently allowed in the U.S. Many U.S. companies have invested heavily to pursue opportunities in those markets, even if they would prefer to invest here at home. This trend will continue to accelerate so long as there remains skepticism regarding the U.S. Government's ability to deliver on its promise to integrate UAS safely into the NAS and enable scalable UAS operations. Timely implementation of a final BVLOS rule is essential to the U.S. maintaining and enhancing its global leadership in advanced aviation for years to come.

To this end, Congress should direct the FAA to issue a notice of proposed rulemaking enabling BVLOS operations in alignment with the recommendations of the BVLOS ARC within 180 days of enactment.

*Question 2.* What actions can the FAA take today—through policy changes and other measures already within the FAA's existing authority—to make progress on the ARC's recommendations while a more comprehensive rulemaking process takes place?

Answer. As recommended by the BVLOS ARC, the FAA should develop an interim, expedited pathway to small-scale BVLOS operations that do not present significant impacts on the environment. Such a pathway would enable UAS operations at a sufficiently meaningful scale to encourage the industry's viability, provide significant benefits to the American people, and ensure American competitiveness, while simultaneously facilitating data collection to inform future rulemaking.

One of the most significant actions that the FAA can take right now is to immediately implement the BVLOS ARC's recommendation for enabling low-altitude "shielded" operations that permit drones to fly above and within very close proximity to structures and terrain where crewed aircraft are unlikely to operate. Shielded operations, sometimes referred to as "masked operations," can enable pub-

lic safety missions such as search and rescue, as well as more efficient inspection of critical infrastructure like long range powerlines, pipelines, and railroad tracks that require drones to fly at low altitude and in close proximity to structures and the ground. Other jurisdictions, including the European Union and Australia, have already established frameworks to enable shielded operations at scale using standard scenarios or pre-defined risk assessments. Congress should direct the FAA to issue guidance similar to what other civil aviation authorities have done to provide a near-term pathway to enabling shielded BVLOS operations before the completion of a comprehensive BVLOS rulemaking.

The FAA should also look for opportunities to streamline current processes and timelines for issuing waivers and exemptions that enable BVLOS operations prior to completion of a comprehensive rulemaking, and to provide more reliable and transparent visibility into the status and anticipated time for completion of its work on individual applications for such approvals. Congress should also require the FAA to provide Congress with periodic tracking reports on the inventory of pending applications, as well as supporting rationales when the FAA rejects applications.

*FAA Air Traffic Control Staffing and New Entrants.* Earlier this year, acting FAA Administrator Billy Nolen said that the FAA is hiring 1,500 new air traffic controllers as part of an effort to combat the increased number of delays and cancellations we have seen in the air travel system this year. According to data from flight tracking site FlightAware, between May 27, the Friday before Memorial Day, and August 14—48,000 or 2.3 percent of the flights scheduled were cancelled. During that same period, nearly 483,000 U.S. flights were delayed, or roughly 24 percent of flights.

Clearly airlines must do better. But it is also important that FAA has enough air traffic controllers to handle current volumes of traffic—and is prepared to coordinate future airspace operations that will include drones, AAM aircraft, and a higher frequency of commercial space flight launches.

*Question 1.* The National Air Traffic Controllers Association (NATCA) has called for improvements to FAA's current Air Traffic Controller Workforce plan to reflect the training and qualification required for air traffic controllers. How can FAA better plan and prepare the ATC workforce to handle the added workload of new entrants entering the National Airspace System?

Answer. It is critical that the FAA, with the support of Congress, invest in the workforce of tomorrow. The commercial drone marketplace is creating new jobs that requires a unique set of engineering and technical skill sets. A key component of planning for the integrated airspace of tomorrow should include a workforce development plan, including a focus and prioritization on science, technology, engineering, and mathematics (STEM) education.

With regard to air traffic in particular, it first must be noted that a large percentage of drone operations will occur at low altitudes outside of ATC control, thereby not adding to the workload of the ATC workforce. An important principle established by the International Civil Aviation Organization (ICAO) notes that, “. . . an equitable cost-recovery system could comprise charges based on the allocation of total air navigation services costs incurred on behalf of users.”<sup>1</sup> Consistent with this principle, it is understood that many drone operations will use UAS Traffic Management (UTM) systems to manage low altitude air traffic, rather than rely on direct service from ATC controllers.

In controlled airspace, the FAA's Low Altitude Authorization and Notification Capability (LAANC) system supports UAS integration by automating the application process for accessing controlled airspace for the vast majority of UAS, rather than requiring direct interaction between UAS operators and ATC personnel.

Industry stakeholders and the FAA both view LAANC as a precursor to a future UTM system that will facilitate highly-automated traffic management for high volume of UAS operations occurring in low altitude airspace. While some unique UAS operations may still require traditional ATC services, this should be the exception. Like the current LAANC system, UTM technology will provide a system by which the vast majority of UAS can access controlled airspace without added burden on the ATC workforce.

As new entrants, including UAM and other aircraft beyond UAS, become more prevalent, it is essential that the current airspace access automation efforts continue and that appropriate operational rules and infrastructure are in place to handle the expected increased demand.

A recent audit by the U.S. DOT Office of Inspector General (OIG) found that, while the FAA has made initial progress in developing and testing UTM frame-

<sup>1</sup> ICAO Doc. 9082, “ICAO's Policies on Charges for Airports and Air Navigation Services”, Sec. III, p. 15.

works, the FAA has not established milestones for implementing the policies and processes necessary to allow for UTM deployment and progress has generally been slow in implementing Congressional mandates surrounding UTM.<sup>2</sup> To help address the delay concerns identified in the OIG audit report, Congress should direct the FAA to develop a long-term roadmap with clear milestones for the development and operationalization of a robust UTM system.

Finally, Congress should invest in the workforce of tomorrow. The Senate should pass the Bipartisan Drone Infrastructure Inspection Grant (DIIG) Act, recently passed by the House of Representatives, which would provide grants to community colleges and universities to train new and existing workers on drone technology and to prepare them for careers in aviation and STEAM, building on unfunded programs established in the 2018 FAA Reauthorization Act.

*Question 2.* In conjunction with partners like NASA, FAA is in the process of developing a UAS Traffic Management (UTM) implementation plan to enable multiple beyond visual line-of-sight drone operations at altitudes below 400 feet where FAA air traffic control services are not provided. What actions should Congress take to ensure timely FAA implementation of UTM capacity and integration of drone operations?

*Answer.* UTM will be critical to the safe and secure expansion of UAS operations into the NAS. Without UTM, the countless benefits of expanded, scalable, and complex UAS operations for Americans and American businesses will be more difficult to achieve. As a precursor to a UTM system, Congress should direct the FAA to enable and encourage the modernization and evolution of the LAANC program. In particular, the FAA should permit approved UAS Service Suppliers (USSs) to utilize application program interfaces (APIs) and deep linking with the software products of third parties, putting a more user-friendly and cohesive interface at the UAS operator's fingertips to access an ecosystem of services that support aviation safety and efficiency. This modernization of the Low Altitude Authorization and Notification Capability (LAANC) system will enhance safety by increasing compliance among airspace users, and avoid a chilling effect on innovation in the United States. Beyond enhancing safety, the implementation of UTM is also critically important to operationalizing scaled UAS operations in the United States. This fact has been recognized by other civil aviation authorities around the world as they make progress implementing comparable UTM systems, like the European Union's U-space system and Australia's Flight Information Management System.<sup>3</sup> Congress should direct the timely operationalizing of UTM and direct the FAA to enhance transparency around UTM so industry can plan accordingly.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN HICKENLOOPER TO  
LISA ELLMAN

*UAS Research and Development Investments.* Ms. Ellman, as you are no doubt aware, the recently passed CHIPS and Science Act (P.L. 117-167) included significant investments in our Nation's high technology research, development, and manufacturing capabilities.

*Question.* Are the investments we are making through CHIPS and Science sufficient to support U.S. drone technology development and manufacturing, or should more be done to specifically support this sector of industry?

*Answer.* Investments are helpful, and enactment of the bipartisan Drone Infrastructure Inspection Grant (DIIG) Act would be helpful as well. To the extent the DIIG Act, which was recently passed by the U.S. House of Representatives and introduced in the Senate by Senators Rosen, Blumenthal, and Boozman is not enacted in 2022, we encourage Congress to ensure this critical program is enacted in the 2023 FAA Reauthorization. This Program would have two fundamental pillars, each administered by the DOT:

- (1) \$100 million to enable States, cities, and tribal governments to inspect America's aging infrastructure with drone technology (including by funding program management capacity or drones), thereby making workers safer, inspections more efficient, and infrastructure more resilient, while supporting high-paying jobs in inspection and U.S. drone manufacturing; and

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<sup>2</sup>FAA Faces Significant Barriers to Safely Integrate Unmanned Aircraft Systems into the National Airspace System (OIG Report No. AV2014061), June 26, 2014.

<sup>3</sup>Beechener, Jenny. "Industry, Regulators Discuss Challenges of Slowing UTM Deployment." *Unmanned Airspace*. <https://www.unmannedairspace.info/uncategorized/industry-regulators-discuss-challenges-of-slowing-utm-deployment/>. Accessed 31 October 2022.

- (2) \$100 million for grants to community colleges and universities to train new and existing workers on drone technology and to prepare them for careers in aviation and STEAM, building on unfunded programs established in the 2018 FAA Reauthorization Act.

Beyond the DIIG Act, Congress can also help support U.S. drone technology development and manufacturing in the United States, including the creation of domestic jobs, by providing funding necessary to enhance and expand the successful Blue UAS program used by the Department of Defense (DOD) Defense Innovation Unit (DIU) to vet commercial UAS technology for DOD use.

Congress should also require a report on the extent to which DOD and other agencies can replicate the Army's experience of rapidly procuring UAS systems in large numbers.

Additionally, Congress should consider other targeted funding measures designed to support a more competitive playing field and support the domestic manufacturing of green, clean, secure UAS technology.

But alongside investment, we need policy—the regulatory frameworks are holding back private investment into the U.S. drone marketplace and jeopardizing America's longstanding leadership in aviation.

A key barrier to private investment in the U.S. drone marketplace revolves around the process for authorizing UAS research and development operations in the U.S. UAS R&D activities help support the safe and efficient integration of UAS into the NAS. However, current R&D processes do not enable broad testing in the U.S. in a timely way. For R&D involving UA that weight 55 pounds or more, it can take several years to obtain all of the operational and airworthiness approvals necessary to conduct limited R&D operations in a controlled and safe environment.

There are several important and concrete steps that Congress can take to help address this situation. (1) Congress should direct the FAA to streamline R&D processes through a risk-based regulatory framework. (2) Congress should direct the FAA to utilize existing authorities to enable test sites and public-private partnerships to move UAS integration forward and promote U.S. leadership in aviation, including requesting a timeline from the FAA for immediate implementation of 49 U.S.C. § 44803. (3) In addition, to assist the FAA in carrying out the objectives of the UAS Test Site program, Congress should clarify that UAS operated for R&D purposes at UAS Test Sites meet the definition of "public aircraft" in 49 U.S.C. § 40102(a)(41) and qualify for public aircraft operations (PAO) status under 49 U.S.C. § 40125. (4) Congress should direct the FAA to encourage the continued use and expansion of technology innovation zones and support communities that are eager to embrace new technologies such as UAS. (5) Congress also should renew or extend the test site mandate from the FAA Modernization and Reform Act of 2012.

Finally, there must be a viable path to commercialization for UAS manufacturers and operators. Enabling R&D operations is critical, but spurring private investment into the U.S. drone marketplace will only occur if companies can operationalize at scale in the U.S. Expedient implementation of the Beyond Visual Line Of Safety Aviation Rulemaking Committee's recommendations is an essential component to enabling expanded UAS operations and allowing companies to operationalize and scale in the U.S.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO  
LISA ELLMAN

*FAA Engagement with New and Traditional Aviation.* From commercial aircraft and private jets to airports and air force bases, the aviation industry is critical to Georgia's economy and national security. The Federal Aviation Administration (FAA) is an essential partner in aviation, certifying existing and new aircraft models and ensuring they meet Federal safety and operational standards. As emerging aviation technologies such as advanced air mobility (AAM) and unmanned aircraft systems (UAS) promise revolutionary changes to commercial and business aviation, the role of the FAA will become even more important.

*Question.* How should Congress and the FAA engage with new aviation entrants while also sustaining proper engagement with the traditional aviation community, to help foster innovation and growth? Does the FAA have the resources it needs to adequately manage its engagement with new entrants and traditional aviation users, as both experience record demand?

*Answer.* As a threshold matter, we would note that there are certain challenges with bundling UAS and AAM together as they are on different deployment timelines. As you know, commercial drone use—whether for delivery, inspection, or

other beneficial use cases—is ready for roll out (as happening somewhat domestically with limitation, and more robustly in some areas overseas). More complex operations, like autonomous passenger electric vertical take-off and landing (eVTOL) operations, are still maturing.

Proper engagement with all aviation stakeholders is critical; however, there are deficiencies with the FAA’s current organizational structure that hinder the agency’s engagement with new entrants, particularly with respect to UAS stakeholders. Congress should reorganize the FAA to better align responsibility for UAS integration with authority over UAS approvals, which would help the FAA be more efficient and timely. The UAS Integration Office is tasked by Congress to lead the FAA’s efforts to safely integrate UAS and AAM operations into the NAS. Despite this mandate, the FAA’s UAS Integration Office has no authority to actually integrate UAS. Instead, responsibility for UAS integration is diffused and splintered across many different FAA lines of business, each with its own existing set of traditional aviation responsibilities and mandates.

This disconnect between responsibility and authority is a critical weakness in the FAA’s current UAS framework. To address this systematic misalignment, Congress should create a new position of Associate Administrator to oversee UAS integration and thereby empower the FAA’s UAS Integration Office with the resources and authorities to fulfill the mandate of UAS integration into the NAS. This office should have the dual mandate of ensuring the safe integration of UAS into the NAS and encouraging and promoting a commercially viable UAS industry and American leadership in UAS. The Associate Administrator should have the authority to approve UAS rulemaking, as well as certification and operational approvals for specific low risk categories of UAS.

*Efficient Integration.* New aviation entrants like UAS and commercial space flight promise new and exciting opportunities for the commercial aviation and space industries. However, as the two technologies grow in adoption and increase their use of the National Airspace System (NAS), I believe it will be critical that Congress, the FAA, and the aviation industry work together to ensure smooth integration that prioritizes safety and the American public.

*Question.* What specific actions should the FAA and new aviation entrants take to ensure effective and efficient integration in to the NAS?

*Answer.* Policy has lagged behind technology, and integration efforts have lagged behind the pace of innovation in America. Notwithstanding the valiant efforts of certain staff at the FAA and other industry stakeholders, progress toward safe and scalable UAS operations integrated into the NAS has been slow and halting, and America is being left behind. To deliver on its promise to integrate UAS into the NAS, it is essential that the FAA work diligently to enable expanded operations and allow UAS operations to scale safely. To that end, Congress should direct the FAA to issue a timely notice of proposed rulemaking enabling BVLOS operations in alignment with the Beyond Visual Line Of Safety (BVLOS) Aviation Rulemaking Committee’s recommendations.

Congress should also direct the DOT and the FAA to improve and expedite the airworthiness approval process for UAS technologies. For several years, the FAA has tried and failed to adapt the existing and burdensome airworthiness process to UAS.

Congress should direct the FAA to adopt industry-based standardized airworthiness compliance standards, modeled after the FAA’s light-sport aircraft certification process, to provide manufacturers with clear guidance on how to obtain FAA airworthiness approval. Improving these critical processes will promote UAS innovation while ensuring that technological, safety, and security advances are implemented efficiently. It is also important that Congress provide adequate resources for the FAA to implement advanced aviation certification programs.

Congress should direct the DOT and FAA to consider inter-modal risk tradeoffs when authorizing BVLOS UAS operations.<sup>1</sup>

Given the rapid advances in UAS technology, it is also essential that industry stakeholders actively engage with and work to educate policymakers and regulators on new technologies and the ways in which technological advancements can improve the overall safety and efficiency of operations in the NAS. The Commercial Drone Alliance looks forward to continuing its many years of engagement and education with policymakers and regulators.

<sup>1</sup>National Academies of Sciences, Engineering, and Medicine 2018. *Assessing the Risks of Integrating Unmanned Aircraft Systems (UAS) into the National Airspace System*. Washington, DC: The National Academies Press. Found at <https://doi.org/10.17226/25143>.

*New Entrant Contributions.* From investments in our Nation’s airports to improvements to the air traffic control (ATC) system, the Aviation Trust Fund plays a critical role in supporting and enabling the day-to-day operations of the aviation industry. Traditional aviation users of the ATC system, such as commercial airlines and airports, pay into the Aviation Trust Fund through a number of Federal taxes and fees. However, new entrants are not currently required by Federal law to contribute to the fund.

*Question.* Should the new entrants in the uncrewed community pay fees or provide other contributions to the Aviation Trust Fund? How can Congress and the FAA ensure equitable contributions to fund the costs of ATF?

*Answer.* Modernization of our overall transportation infrastructure is critically important, and comes with costs, but it will provide significant and broad benefits to society.

CDA sincerely appreciates this question because, we believe, the emerging UAS and AAM industries are currently contributing to the system through ongoing work to develop and deploy protocols and technologies to safely integrate new entrants into the NAS.

For example, as you and your colleagues know, our industry stakeholders are investing heavily in coordination and deconfliction technologies, like UTM and Detect And Avoid (DAA) systems, to allow for scaled commercial deployment. Furthermore, many of the companies and organizations represented by CDA are deploying internationally and are sharing lessons learned with government entities like the FAA and NASA. For instance, NASA is partnering with CDA board member Zipline to answer *questions about the future operations of autonomous fleets* and CDA board members Amazon, Northeast UAS Airspace Integration Research (NUAIR), and Wing to answer questions about future UTM integration. These and other investments and efforts are essential to America remaining a leader in future aviation systems and critical to America’s abilities to set global norms and standards.

The Airport & Airway Trust Fund was *established in 1970*, 35 years after a group of airlines started the first *Airway Traffic Control Station*. There is certainly room for improvement to reflect today’s aviation ecosystem. The UAS industry appreciates the need for innovative partnerships—including public-private partnerships—as well as new approaches to ensure that a modern sustainable infrastructure is available to provide the greater societal benefits that are possible with drone technology. An important principle established by the International Civil Aviation Organization (ICAO) notes that, “. . . an equitable cost-recovery system could comprise charges based on the allocation of total air navigation services costs incurred on behalf of users.”<sup>2</sup> Consistent with this principle, it is understood that many drone operations will use UTM systems to manage low altitude air traffic, rather than rely upon direct service from ATC controllers.

It is also important to note that there are a lot of efficiencies the agency could gain in its UAS integration efforts. There is often inconsistent and heavy staffing of simple projects, but if our FAA reorganization proposal was implemented, it could lead to efficiencies for the agency without affecting safety.

The Drone Advisory Committee (now AAAC) has done a lot of thinking on this topic and published a report in 2018 with some ideas on equitable sharing of costs. We look forward to engaging with the broader aviation community on this important topic.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER WICKER TO  
LISA ELLMAN

*Question 1.* Getting airworthiness approval, or a type certificate, for UAS aircraft is a critical part of advancing UAS technology. After more than four years of work, only a single type certificate has been issued for the entire UAS industry with dozens more applications sitting at the FAA. Recognizing the low-risk nature of small UAS, what are the challenges that remain before the FAA issues type certificates?

*Answer.* Type certification has traditionally been considered key to accelerating the integration of complex, safe drone operations into the National Airspace System. Yet, as you point out, after several years of work, there has only been one type certificate issued. The CDA hopes that, since the FAA has now done this successfully once, the FAA can expeditiously incorporate lessons learned and streamline and improve the process for the agency and the broader industry.

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<sup>2</sup> ICAO Doc. 9082, “ICAO’s Policies on Charges for Airports and Air Navigation Services”, Sec. III, p. 15.

There are several challenges that remain for issuing type certificates for small UAS. For example, the FAA has tried and failed to adapt the existing and burdensome airworthiness process to UAS. It is critical that the type certification and airworthiness processes be improved, adapted, and tailored for small UAS. The inflexibility of the type certification process to accommodate iterative technological advancement of UAS designs—more akin to once-a-year updates of cell phone models rather than once-a-decade updates of large passenger aircraft models—suppresses UAS innovation. Under the current process, by the time the FAA issues a type certificate for a UAS model, the certificated technology might no longer be the state of the art.

Another challenge revolves around noise certification. Under the current regulatory process, the FAA may only issue an original type certificate for an aircraft after the FAA determines that the aircraft meets prescribed noise standards. There are no prescribed noise standards for small UAS, which means the FAA needs to undertake a lengthy (years-long) and resource-intensive rulemaking process for every individual small UAS going through the type certification process to establish custom noise standards on a case-by-case basis. Rather than requiring the FAA to establish unique noise standards for every single different type of small UAS going through the certification process, Congress should direct the FAA to gather data necessary to establish generally applicable noise standards for small UAS and should exempt low-risk small UAS from noise certification requirements.

Given the lack of progress on UAS type certification, the agency should work diligently to implement a new regulatory framework that right-sizes the risk analysis for scaled UAS operations. In particular, as discussed more fully below, the FAA must expeditiously implement the BVLOS ARC recommendations.

*Question 2.* The BVLOS Aviation Rulemaking Committee issued its recommendations in March 2022. Can you highlight some of the most significant recommendations in terms of safety and pilot training?

Answer. The BVLOS Aviation Rulemaking Committee report (“ARC Report”) contains a number of critical expert recommendations, advice, and information that the FAA needs to safely and effectively update its regulatory framework and normalize safe, scalable, economically viable advanced aircraft operations in the United States. Below is a brief summary of what the CDA considers to be the most significant recommendations in the ARC Report in terms of safety and pilot training.

- *Right-of-Way Rules.* The ARC’s proposed aviation right-of-way rules recognize that the airspace is shared and collaborative. Since the current right-of-way rules do not address autonomous aircraft, the ARC’s recommendations reflect a shared risk model in order to safely integrate autonomous aircraft, taking into account the volume and nature of aircraft operations currently at this altitude and aircraft collision avoidance roles and responsibilities. This recommendation enhances safety for all airspace users. It will better protect pilots who operate at these critically-low altitudes from potential collisions, and will allow thousands of extremely high-risk low-altitude operations (such as power line inspections or chemical spill monitoring) to be accomplished instead by drone more safely, saving lives every year.
- *Pilot Training and Qualification Based on Levels of Automation.* The ARC recommended that the BVLOS training and qualification requirements be tailored to levels of automation (AFR Levels 1, 2, 3, 4). Under this proposal, as UAS control automation becomes more robust, the number/types of control tasks that require human in-/on-the-loop tend to decrease, and thus the level and depth of training required to operate such UAS safely correspondingly decrease. In sum, BVLOS UAS training programs must be tailored to focus on those functions that the responsible pilot has the ability to control or affect through the system.
- *Establish New BVLOS Rating for Remote Pilot Certificate.* The ARC Report also recommends that the FAA establish a new BVLOS rating for the remote pilot certificate, and that the BVLOS rating process incorporate additional knowledge and examination areas to support advanced BVLOS (including Right-of-Way Rules for BVLOS operations, BVLOS Strategic and Technical Risk Mitigation Strategies/Approaches, and Principles of Uncrewed Traffic Management, among others).

*Question 3.* Are there actions that the FAA can take today—through policy changes and other measures already within the FAA’s authority—to make progress on the ARC’s recommendations while a more comprehensive rulemaking process unfolds? Additionally, can you describe the economic and public safety impacts if the FAA does not complete a timely rulemaking on BVLOS operations?

Answer. (A). As recommended by the BVLOS ARC, the FAA should develop an interim, expedited pathway to allow small-scale BVLOS operations that do not present significant impacts on the environment. Such a pathway would enable UAS operations at a sufficiently meaningful scale to enable the industry's viability, provide significant benefits to the American people and ensure American competitiveness, while simultaneously facilitating data collection to inform future rulemaking.

One of the most significant actions that the FAA can take right now is to immediately implement the BVLOS ARC's recommendation for enabling low-altitude "shielded" operations that permit drones to fly above and within very close proximity to structures and terrain where crewed aircraft are unlikely to operate. Shielded operations, sometimes referred to as "masked operations", can enable public safety missions such as search and rescue, as well as more efficient inspection of critical infrastructure like long range powerlines, pipelines and railroad tracks, that require drones to fly at low altitude and in close proximity to structures and the ground. Other governments, including the European Union and Australia, have already established frameworks to enable shielded operations at scale using standard scenarios or pre-defined risk assessments. Congress should direct the FAA to issue guidance similar to what other civil aviation authorities have done to provide a near-term pathway to enable shielded BVLOS operations before the completion of more comprehensive BVLOS rulemaking.

The FAA should also look for opportunities to streamline current processes and timelines for issuing waivers and exemptions that enable BVLOS operations, prior to completion of more comprehensive rulemaking.

Additionally, the FAA should use its existing authorities to enable test sites and public-private partnerships to move UAS integration forward and promote U.S. leadership in aviation, including immediate implementation of 49 U.S.C. § 44803. To support carrying out the objectives of the UAS Test Site program, the FAA should also revise and clarify its current interpretation of public aircraft operations ("PAO") so that UAS operated for R&D purposes at UAS Test Sites meet the definition of "public aircraft" in 49 U.S.C. § 40102(a)(41) and qualify for PAO status under 49 U.S.C. § 40125.

Finally, the FAA should implement rules it has already finalized—such as the operations over people (OOP) rule—and finish work that has been started. To date, only a single drone model has an FAA-accepted Declaration of Compliance authorizing operations over people under the OOP rule. BVLOS operations at scale will need to include flight over people, and the lack of attention to this issue will impede the industry's growth.

(B). BVLOS operations are critically important if scalable, beneficial UAS operations are to become a reality in the United States. There will be significant economic and public safety costs if the FAA does not timely complete the BVLOS rulemaking. The failure to promulgate a final BVLOS rule in a timely manner would prevent the industry from bringing the countless benefits of UAS operations to the American public (*e.g.*, drone delivery of medicines, PPE, and day-to-day commercial products; post-natural disaster inspections and assessments, delivery of emergency equipment; search and rescue; environmentally-friendly and sustainable operations, enhancing worker safety, and more). Pages 14–19 of my written testimony include details on the many societal benefits of civil BVLOS UAS operations.

The lack of a path for scaling BVLOS operations in the U.S. (as reflected by the absence of a final BVLOS rule) also significantly undermines U.S. competitiveness and jeopardizes the longstanding global leadership of the U.S. in aerospace. What can and should continue to be a booming American commercial UAS industry will see companies forced to move overseas or close. If companies can iterate new models of aircraft and operations and scale their businesses in other countries, the U.S. will continue to experience a loss of UAS investment, innovation, and competition. Once a company is operating abroad, it is unlikely to shift its investments back to the U.S. without regulatory certainty, and the American UAS industry will fall behind.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO  
STÉPHANE FYMAT

*U.S. Leadership in Sustainable Aviation Technology.* You note in your testimony that the United States must maintain its global aviation leadership and enable the development of Advanced Air Mobility (AAM), which can make flight more sustainable through hybrid electric systems, batteries, and hydrogen fuel cells. In more traditional aircraft and propulsion systems, developing sustainable aviation fuel (SAF) at scale is critically important to reduce aviation's growing carbon footprint. International coordination will be important. Last month in Montreal, the United States

and other civil aviation authorities, met for the 41st session of the International Civil Aviation Organization (ICAO) to discuss aviation decarbonization among other topics. The United Nations expects aircraft carbon emissions to triple by 2050.

*Question 1.* What steps can the United States take with international partners to foster the development of sustainable aviation technologies? How can FAA leverage existing bilateral safety agreements and technical assistance programs to further AAM technologies, harmonize safety standards, and facilitate the certification process?

Answer. Chair Cantwell, thank you for your questions. With respect to your first question: “What steps can the United States take with international partners to foster the development of sustainable aviation technologies?”

Step 1: Ensure we have common regulatory frameworks for aircraft certification, aircraft operation, vertiport design and environmental impact. This will provide aircraft developers and operators with a clear and global set of rules on which to develop business plans, raise investment capital, operate businesses and be compliant to sustainability obligations. This fosters innovation of sustainable technologies and ensures that focus is placed on the solutions that provide the maximum impact.

Step 2: Conclude rulemaking on Beyond Visual Line of Sight (BVLOS) operations for drones and have them take effect in 2024, not 2029. Enabling long distance drone operations will drive demand for better batteries, fuel cells, detect-and-avoid systems, GPS-denied navigation systems and autonomy software—over and above that driven by Electric Vertical Takeoff and Landing (eVTOL) air taxis.

With respect to your second question: “How can FAA leverage existing bilateral safety agreements and technical assistance programs to further AAM technologies, harmonize safety standards, and facilitate the certification process?”

The majority of Advanced Aerial Mobility (AAM) vehicles are being developed in the United States, United Kingdom and Europe, subject to FAA, U.K. Civil Aviation Authority (UK CAA) and European Union Aviation Safety Agency (EASA) regulation for aircraft certification, respectively. The U.K. has decided to harmonize its aircraft certification standards with that of EASA. The U.S. has an existing bilateral aviation safety agreement with EASA that provides a framework whereby each region can accept the airworthiness certificate of the other. Furthermore, 14CFR Part 21 §21.29(a)(1)(ii) also enables the FAA to accept EASA’s airworthiness requirements where they are the State of Design of a product with which a bilateral exists. This would be valid where the EASA requirements provide an equivalent level of safety to those that would be provided by the FAA for the same product.

Step 1: The Federal Aviation Administration (FAA) can decide and issue a policy or Advisory Circular (AC) that any applicant that chooses to certify its aircraft using EASA’s Special Condition for small-category VTOL aircraft (known as “SC/VTOL”) standard will be an acceptable certification basis by FAA.

This step has several major benefits:

- All European and U.K. aircraft developers will have the assurance that their vehicles will be certifiable in the U.S. at no extra cost. This helps enable their success in certifying their vehicles and beginning flight operations in the US. This is important, as U.S. technology companies—such as Honeywell, but including others—are key providers to them. U.S. technology leadership in key AAM technologies is thereby enhanced.
- U.S. aircraft developers who are targeting a global market will have to comply with EASA’s SC/VTOL standards anyway, regardless of what the FAA decides. This step therefore provides them a clear and immediate pathway to get their vehicles certified—which helps them and the technology providers.
- The FAA retains all of its latitude to develop its regulatory framework as it sees fit. SC/VTOL is widely seen as a more stringent set of requirements than what the FAA envisions, *i.e.*, a superset of its envisioned requirements. Therefore, any SC/VTOL-compliant vehicle will exceed the FAA requirements.
- It costs nothing and can be acted upon immediately.

Step 2: The FAA has discussed making its certification framework a “safety continuum” whereby different regulatory requirements would apply to a vehicle depending upon the size, passenger capacity and other characteristics of the vehicle. Make it a mandate that this continuum provides at least one a pathway that is harmonized with EASA, even if it also provides other pathways that are not harmonized.

This step has the same benefits as Step 1 but provides a formal means by which U.S. applicants can apply for aircraft certification using a U.S. regulation, knowing that it will be able to be validated by EASA and U.K. CAA.

*Question 2.* U.S. leadership at ICAO is important. This is something we stressed as part of reform enacted through the Aircraft Certification, Safety and Accountability Act, including raising the safety bar globally in areas like pilot training standards. What policies and strategies should the United States pursue at ICAO for advancing AAM and sustainable aviation technology?

*Answer.* Advanced Aerial Mobility (AAM) aligns with all of The International Civil Aviation Organization (ICAO's) strategic objectives—aviation safety, air navigation capacity and efficiency, security and facilitation, economic development and environmental protection. It also aligns with several of ICAO's key initiatives—innovation in aviation, humanitarian assistance and disaster response in aviation, and state action plans for aviation CO<sub>2</sub> reduction. ICAO does a lot of work to develop standardized regulations and policies across the globe that are then adopted by its member nations.

The United States should engage with ICAO to create the task forces to perform the research and arrive at guidelines that can be adopted on a global scale. This ensures that AAM can be deployed globally in a straightforward fashion.

Linking the ICAO initiatives on efficiency with their targets for environmental protection can provide a roadmap for near term initiatives to improve Airline operations at the same time assisting in meeting travel demand during a time of supply chain disruption. Clear guidance on the benefits of improved efficiency of Airline operations and "Scope 4" impact to Airport and infrastructure requirements will incent investment decisions that may not currently be under consideration.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO  
STÉPHANE FYMAT

*FAA Engagement with New and Traditional Aviation.* From commercial aircraft and private jets to airports and air force bases, the aviation industry is critical to Georgia's economy and national security. The Federal Aviation Administration (FAA) is an essential partner in aviation, certifying existing and new aircraft models and ensuring they meet Federal safety and operational standards. As emerging aviation technologies such as advanced air mobility (AAM) and unmanned aircraft systems (UAS) promise revolutionary changes to commercial and business aviation, the role of the FAA will become even more important.

*Question.* How should Congress and the FAA engage with new aviation entrants while also sustaining proper engagement with the traditional aviation community, to help foster innovation and growth? Does the FAA have the resources it needs to adequately manage its engagement with new entrants and traditional aviation users, as both experience record demand?

*Answer.* Senator Warnock, thank you for the question. This is an excellent question, the foundation of Honeywell Aerospace is more than 100 years of safety innovation, and we work with the full breadth of the civil and defense aviation community—including commercial, business, and general aviation. Safety is our number one priority.

At the moment, the FAA does not have a formal mandate to foster innovation, it only has a formal mandate to ensure safety. Furthermore, the FAA seems to be of the mindset that innovation is de facto a risk to safety and that the way to way to manage this risk is to go slowly and minimize the capability of these innovations when introducing them into the airspace. We have seen this before with light sport aircraft—where the performance limitations imposed did nothing to improve safety and hobbled what should have been a new wave of modern aircraft. We are seeing it now with Uncrewed Aircraft Systems (UAS) Beyond-Visual-Line-Of-Sight (BVLOS) rulemaking, where it seems increasingly likely that we won't have fully scalable BVLOS operations in the U.S. until 2030—making the U.S. one of the last countries in the world to have broad commercial and public sector UAS operations.

How should Congress engage with new aviation entrants? First, Congress should change the mandate of the FAA to be a dual mandate—safety and innovation, with safety always remaining the top priority. The FAA can and should enable safe innovative operations. Second, Congress should hold the FAA accountable for the safety impacts of *not* enabling innovations into the airspace soon enough, such as the number of lives lost by not allowing the use of drones for agricultural spraying, wildfire fighting, etc. Third, Congress should hold the FAA accountable to deadlines by which it will accomplish certain regulatory objectives. Nothing ever got done on time without a deadline. These three changes go far beyond Advanced Aerial Mobility

(AAM) and UAS and enable the FAA to embrace any new innovation, especially those that improve safety.

We believe that the FAA needs to be resourced to succeed in both Advanced Air Mobility and traditional aviation, today they are not. These industries are not mutually exclusive, but together will determine if the United States retains its global leadership position in aviation or not. This will require securing additional talent, focus, and commitment. We believe the FAA needs more resources in order to adequately address the growing certification pipeline of the novel UAS and AAM platforms which are increasing rapidly, and to expedite the necessary rulemakings. This includes the need for additional dedicated personnel focused on UAS/AAM certification and rulemaking.

Many industry players in the traditional aviation community are also heavily invested in new companies or AAM products so the lines are blurred. Traditional aviation is using AAM to advance key technology in electrification and autonomy. The FAA needs to engage the AAM community to advance aviation safety and innovation across the board.

*Efficient Integration.* New aviation entrants like UAS and commercial space flight promise new and exciting opportunities for the commercial aviation and space industries. However, as the two technologies grow in adoption and increase their use of the National Airspace System (NAS), I believe it will be critical that Congress, the FAA, and the aviation industry work together to ensure smooth integration that prioritizes safety and the American public.

*Question.* What specific actions should the FAA and new aviation entrants take to ensure effective and efficient integration into the NAS?

Answer. Senator Warnock, thank you for your question. We certainly agree with you that collaboration between government and all aviation stakeholders is essential to integrating new entrants into our shared National Airspace System (NAS).

The Federal Aviation Administration (FAA) should continue to work with Advanced Aerial Mobility (AAM) entrants to pragmatically and safely integrate UAS/UAM operations. To this end, the FAA should organize more robust industry pilot programs to expand and standardize UAM/AAM Concepts of Operations (CONOPs) with NASA and solicit industry input. The FAA should identify existing gaps to current flight rules (including establishing pilot training requirements for UAS and AAM pilots), establish flight corridors, procedures, and separation services to scale AAM operations without overburdening the Air Traffic Control (ATC) system.

Looking forward, the FAA should accelerate the development of digital flight rules to scale up the capacity of the NAS for all users and aviation modalities. In this context, Advanced Aerial Mobility is a key leading market and technology accelerator to advance the development of next generation flight management and airspace integration technologies like end-to-end trajectory-based navigation, digital communication and management of flight intent and automated airspace management. These technologies and operational enablers will increase the safety and capacity of the NAS for all users—from crewed-commercial aircraft to AAM. This is why it is important for all of us to remember, the choice before us isn't the advancement of technology or safety, it is that advancing technology can and has historically led the U.S. and the world to greater degrees of aviation safety.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER WICKER TO  
EDWARD M. BOLEN

*Question 1.* The FAA recently announced plans to regulate AAM vehicles as a “special class” of aircraft rather than relying on the “Part 23” framework which governs small airplanes. How has this change affected your operators and how can we on the committee be helpful in assisting operators in their certification processes?

Answer. When the FAA changed the process for advanced air mobility (AAM) aircraft certification, our AAM members adjusted without changing their prearranged timelines. What is paramount in the certification process is transparency and certainty from the FAA.

The agency committed to introducing a Special Federal Aviation Regulation (SFAR) by December 2024 to coincide with the planned introduction of the first AAM commercial operations. This is a critical step in the path to enable commercial AAM operations and pilot licensing, and we welcome the agency's declaration that this change preserves consistency in certification for safety without introducing cumbersome delays to the necessary processes for marketplace introduction. To date, Joby Aviation has completed half of the four-step certification process.

We ask that this Subcommittee closely monitor the agency's stated goal of completing the process for AAM introduction into the NAS by 2024, and continue to encourage transparency and certainty in the process.

While aircraft and operational certification are a major priority, we must also acknowledge the significant work happening in parallel to address other critical components of this new entrant capability, including Unmanned Traffic Management (UTM), air traffic operations, and heliport and vertiport design considerations. Each of these work streams must integrate seamlessly if we hope to realize the potential benefits of our efforts.

For example, in addition to AAM operations that focus on passenger-carrying operations, UAS aircraft continue to demonstrate growing value in critical areas such as search and rescue, public safety and security, package and cargo delivery, life-saving medical supply delivery and other innovative transportation models. Proof-of-concept projects in the U.S. have shown public acceptance and desire for these services. We strongly believe these projects should set the stage for more predictable aircraft and operational certifications.

As part of the upcoming FAA Reauthorization, we look forward to a continued dialogue on how the agency can utilize the existing regulatory structure and innovative operational and aircraft certification concepts to facilitate the safe introduction of these technologies. Providing general aviation with certainty for certification, airspace integration, operational approvals, airport investment and infrastructure standards development will all be critical for the United States to remain a global leader in aviation.

*Question 2.* In recent months, some in the legacy aviation industry have called for new entrants to begin paying into the national airspace, just as commercial aircraft operators do today. As UAS aircraft begin to operate in the NAS more frequently, what steps do you see as necessary to ensure an equitable allocation of FAA fees?

Answer. Business aviation will continue to pay the share that is determined by Congress.

NBAA would recommend that new entrants only pay into the system when they are using controlled airspace and existing or automated air traffic services.

Thankfully the current fee structure works to capture most AAM or "Air Taxis" which will operate under Part 135, a charter-type service with a ticket tax, segment fee, cargo waybill and aircraft registration fee. For commercial space and UAS, a percent of the cargo or payload being transported, seems appropriate.

We look forward to working with Congress to find for electric aviation—eVTOL and eCTOL—an alternative to the fuel tax by converting energy to gallons at the same rate.

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RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER WICKER TO  
GREGORY DAVIS

*Question 1.* In order for the United States to lead in AAM, what must the FAA and industry do to create a pathway for current rotor aircraft pilots to be certified to operate AAM aircraft at levels adequate to keep pace with the growing AAM industry?

Answer. Thank you for the question, Senator Wicker. We appreciate the longstanding leadership of you and your congressional colleagues in advancing the adoption of low-emission aviation technologies. Your efforts are critical to ensuring the aviation industry continues to play its part in achieving our Nation's sustainability goals.

In order to create a pathway for current rotor and fixed wing aircraft pilots to be certified to operate AAM aircraft at adequate levels, the FAA must partner with AAM companies to pioneer new training methods for aircraft operators as the industry prepares for all-electric flight. We must work together to address the need for holistic and comprehensive training resources.

With the collaboration and support of the FAA, we will have the resources necessary to develop and scale robust training programs, provide state-of-the-art flight simulation and unparalleled expertise for a new way of operating aircraft. We must establish our leadership in immersive pilot training programs that put safety and readiness at the forefront of our mission.

*Question 2.* What are some of the regulatory, legislative, and operational challenges that the industry is facing and is the FAA adequately preparing for these challenges?

Answer. I'd like to reinforce my statements from my original testimony, encouraging the FAA to look beyond the borders of the U.S. and work with global regu-

lators, focus on clear requirements for certification of battery technology, and work with agencies from other Departments, such as the Department of Energy, on the development of charging infrastructure and battery technology. These are critical elements in moving the industry towards sustainable aviation.

Additionally, the next generation of aviation will impact airport facilities in a multitude of ways, beginning with three main segments: facilities, utilities and sustainability. As the industry and the world starts to adopt electric aircraft, the existing airport structures will need to adapt for electric transit.

On this front, I believe the FAA and other agencies such as the DOE and NASA, should work together the expansion of aircraft charging networks to service rural and urban airports across the country. These agencies have the opportunity to identify existing airports for electrification and ensure the adequate supply of power to those airports for electric charging networks. This includes electrical utilities that are sufficient to charge and maintain electric aircraft anywhere from 1200 to 4000 amps.

The installation of airport charging systems can be handled through a mix of private enterprise, airport investment and Federal investment to ensure equitable access to sustainable aviation across well-established and underserved airports, such as those in rural communities.

Last, the FAA should make funds available to push forward sustainability initiatives that support the infrastructure outlined above. For example, acquiring funding for solar power, or industrial battery storage, would be a major investment with a huge sustainability offset.

