

FAA REAUTHORIZATION: HARNESSING THE EVOLUTION OF FLIGHT TO DELIVER FOR THE AMERICAN PEOPLE

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BEFORE THE
SUBCOMMITTEE ON
AVIATION
OF THE
COMMITTEE ON
TRANSPORTATION AND
INFRASTRUCTURE
HOUSE OF REPRESENTATIVES
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Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington, DC 20515

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MARCH 27, 2023

SUMMARY OF SUBJECT MATTER

TO: Members, Subcommittee on Aviation
FROM: Staff, Subcommittee on Aviation
RE: Aviation Subcommittee Hearing on “*FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People*”

I. PURPOSE

The Subcommittee on Aviation will meet on Thursday, March 30, 2023, at 10:00 a.m. ET in 2167 of the Rayburn House Office Building for a hearing titled, “*FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People*.” The hearing will focus on the certification, operations and safe integration of new entrants into the National Airspace System (NAS). This hearing is in advance of Congress acting to reauthorize the Federal Aviation Administration’s (FAA) statutory authorities that expire on October 1, 2023. Members will receive testimony from two panels of witnesses. The first panel will include representatives from the unmanned aircraft systems (UAS) sector: Wing; the Alaska Center for UAS Integration at the University of Alaska Fairbanks; the Chula Vista Police Department; and WakeMed Health and Hospitals. The second panel will include representatives of the advanced air mobility (AAM) sector developing manned electric vertical takeoff and landing (eVTOL) and powered-lift aircraft: BETA Technologies; Joby Aviation; Bristow Group Inc. on behalf of the Helicopter Association International (HAI); and an AAM expert and community advocate.

II. BACKGROUND

The primary mission of the FAA is to ensure civil aviation safety.¹ The agency’s key mission activities include the development and promulgation of aviation regulations and guidance to ensure safety; certification of aviation products; development and operation of air traffic control and navigation procedures to ensure reasonable access to the NAS; research on new aviation technologies; and implementation of various programs to reduce disruptions to the aviation system and maintain the safety of all aerospace users and the general public.² The FAA has the responsibility to certify, oversee and regulate the safety and operations of the civil aviation sector, including integrating new entrants like UAS and AAM aircraft into the NAS.³

Congress periodically reauthorizes the FAA and Federal civil aviation programs through an FAA reauthorization bill. The FAA was last reauthorized in October 2018 in the FAA Reauthorization Act of 2018 (FAARA 2018), which expires on Octo-

¹ FAA, *Mission*, available at <https://www.faa.gov/about/mission>.

² FAA, *What we do*, available at <https://www.faa.gov/about/mission/activities>.

³ 49 U.S.C. § 106(g).

ber 1, 2023.⁴ Enactment of the 2018 law followed a series of short-term extensions after the last long-term FAA reauthorization bill expired on September 30, 2015.⁵ FAARA 2018 included a subtitle intended to foster the safe, efficient and timely integration of UAS into the NAS.⁶ Since the passage of FAARA 2018, Congress also enacted bills focused on the development and future deployment of AAM concepts, including the Advanced Aviation Infrastructure Modernization (AAIM) Act (Division Q of P.L. 117–73) and the Advanced Air Mobility Coordination and Leadership Act (P.L. 117–203).⁷

Like many other innovations of flight, UAS, also known as drones, and electric vertical takeoff and landing (eVTOL) powered-lift aircraft, commonly referred to as AAM vehicles or air taxis, have the potential to change the way we travel and transport goods and services. In the upcoming FAA reauthorization bill, Congress has an opportunity to ensure the FAA is properly positioned to support the safe integration of these new entrant technologies into United States airspace and support American innovation. Several new entrant stakeholders support the FAA building upon current research initiatives to advance the potential benefits of these new technologies for consumers and the travelling public.

A. UNMANNED AIRCRAFT SYSTEMS

By statute, an unmanned aircraft (UA) is defined as “an aircraft operated without the possibility of direct human intervention from within or on the aircraft,” while a UAS is defined as a “[UA] and associated elements (including communication links and the components that control the [UA]) required for the operator to operate safely and efficiently in the [NAS].”⁸

The FAA Modernization and Reform Act of 2012 (FMRA) tasked the FAA with establishing a regulatory framework that would allow for the safe integration of UAS into the NAS, including:

- Developing a comprehensive plan to safely accelerate the integration of civil UAS into the NAS;
- Publishing a final rule on small UAS for civil operations in the NAS; and
- Establishing six UAS test sites to support the research and evaluation of UAS into the NAS, among other mandates.⁹

Pursuant to FMRA, the FAA initiated a five-year program to establish these UAS test sites, which became operational in April 2014.¹⁰ The test sites are located at Griffiss International Airport, NY; New Mexico State University, NM; Northern Plains, ND; University of Nevada, Reno; Texas A&M University Corpus Christi, TX; University of Alaska Fairbanks, AK; and Virginia Polytechnic Institute & State University, VA.¹¹

In June 2016, the FAA issued a final rule on the operation of small UAS (weighing less than 55 pounds)—under 14 C.F.R. Part 107 (also known as Part 107)—which significantly expanded and standardized the ability for small UAS operators to conduct commercial activities.¹² To date, Part 107 serves as the sole operating rules exclusive to UAS. Apart from its weight limitation, Part 107 imposes several operational limitations on UAS pilots, such as:

- restricting flights to no higher than 400 feet above ground level;
- requiring the UA remain within the visual line of sight of the remote pilot; and
- prohibiting a remote pilot from operating multiple UAS simultaneously.¹³

Accordingly, UAS weighing 55 pounds and heavier, as well as operations outside of the above defined limitations, must abide by conventional manned aviation regulatory rules or otherwise receive an FAA waiver or exemption.¹⁴ The FAARA 2018 also includes safety requirements for hobby and recreational UAS operations; sup-

⁴ FAA Reauthorization Act of 2018, Pub. L. No. 115–254, 132 Stat. 3186 [*hereinafter* FAA Reauthorization Act of 2018].

⁵ FAA Extension, Safety, and Security Act of 2016, Pub. L. No. 114–190, 130 Stat. 615.

⁶ *Id.* at Subtitle B—Unmanned Aircraft Systems.

⁷ Advanced Aviation Infrastructure Modernization (AAIM) Act, Pub. L. No. 117–328, Division Q; Advanced Air Mobility Coordination and Leadership Act, Pub. L. No. 117–203, 136 Stat. 2227.

⁸ 49 U.S.C. § 44801(11)–(12).

⁹ FAA Modernization and Reform Act of 2012, Pub. L. No. 112–95, 126 Stat. 11, Subtitle B—Unmanned Aircraft Systems.

¹⁰ FAA, *UAS Test Site Program*, available at https://www.faa.gov/uas/programs_partnerships/test_sites.

¹¹ *Id.*

¹² Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,064 (June 28, 2016).

¹³ 14 C.F.R. Part 107 (2023).

¹⁴ 14 C.F.R. § 11.63 (2023).

porting the testing of new UAS technologies; and directing the agency to safely enable more advanced UAS operations, such as package delivery and emergency response services.¹⁵

In January 2021, the FAA finalized two additional UAS rules to further enable advanced UAS operations: (1) Remote Identification of UAS (Remote ID); and (2) Operation of Small Unmanned Aircraft Systems Over People (Ops. Over People).¹⁶ The Remote ID rule requires UAS to broadcast certain identification, location and performance information that can be received by other entities, including the FAA and law enforcement.¹⁷ This is akin to a digital license plate, whereby anyone with a cellphone will be able to see a drone's Remote ID number, but only authorized individuals will be able to access the drone owner's personal information. All drone pilots required to register their UAS must comply with the rule's requirements beginning September 16, 2023.¹⁸ The remote ID rule is a necessary foundational element for more complex and routine commercial UAS operations and the FAA's overall UAS integration efforts.¹⁹ The Ops. Over People rule created requirements for the routine operation of small UAS at night, over people, and over moving vehicles, under certain circumstances, without the need to obtain a waiver or exemption from the FAA, addressing a challenge posed by Part 107's original limitations.²⁰ The rule also amends the recurrent training framework for remote pilots, allowing them to remain current through online training rather than in-person testing, among other changes.²¹

Despite the FAA promulgating rules for small UAS operations, more advanced commercial UAS operations have yet to be achieved in the NAS at scale.²² Currently, there are more than 338,000 commercial UAS registered along with over 308,000 commercial UAS pilots.²³ The UAS industry believes that "... current [FAA] regulations do not enable the domestic UA beyond visual line-of-sight (BVLOS) industry to scale and achieve meaningful results. ... The current rules also do not reflect the competencies needed to safely operate highly automated UAS, which hinders the ability to expand UAS BVLOS."²⁴

While the FAA has made some progress in approving BVLOS operations over the past several years, two of the primary barriers to scaling remain: safety standards for a UAS to avoid other air traffic, and a process to determine the airworthiness of a UAS.

1. Avoiding Other Air Traffic

UAS operating beyond a remote pilot's visual line of sight (commonly referred to as BVLOS) present unique challenges to the FAA's existing regulatory framework.²⁵ Aside from Part 107, most current aviation regulations that would apply to UAS operations assume an aircraft has an onboard pilot responsible for avoiding other aircraft.²⁶ UAS lack an onboard pilot and are either remotely piloted or fly pre-programmed routes autonomously.²⁷ A UAS's capability to be operated remotely and conduct BVLOS operations can offer economic and societal benefits.²⁸ Today, there are several UAS applications that the aviation industry, local communities and industrial sectors have expressed interest in and invested resources to develop and de-

¹⁵ See FAA Reauthorization Act of 2018, *supra* note 4.

¹⁶ Remote Identification of Unmanned Aircraft Rule, 86 Fed. Reg. 4,390 (Jan. 15, 2021); Operation of Small Unmanned Aircraft Systems Over People Rule, 86 Fed. Reg. 4,314 (Jan. 15, 2021).

¹⁷ *Id.*

¹⁸ FAA, *UAS Remote Identification*, available at https://www.faa.gov/uas/getting_started/remote_id/.

¹⁹ See Remote Identification of Unmanned Aircraft Rule, *supra* note 16.

²⁰ See Operation of Small Unmanned Aircraft Systems Over People Rule, *supra* note 16.

²¹ FAA, *Operations Over People General Overview*, available at https://www.faa.gov/uas/commercial_operators/operations_over_people.

²² See generally Harrison Wolf, *Where Will The Drone Industry Be In 2023*, FORBES (Dec. 20, 2022), available at <https://www.forbes.com/sites/harrisonwolf/2022/12/20/where-will-the-drone-industry-be-in-2023/?sh=7fc526e21f1e>.

²³ See FAA, *Drones by the Numbers*, available at <https://www.faa.gov/uas>.

²⁴ See FAA, UNMANNED AIRCRAFT SYSTEMS BEYOND VISUAL LINE OF SIGHT AVIATION RULE-MAKING COMMITTEE, FINAL REPORT 8, (Mar. 10, 2022), available at https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS_BVLOS_ARC_FINAL_REPORT_03102022.pdf [*hereinafter* UAS BVLOS ARC, *Final Report*].

²⁵ See generally UAS BVLOS ARC, *Final Report*.

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.*

ploy UAS technologies.²⁹ Industry stakeholders argue that the FAA’s existing regulatory framework should better support this evolving aviation sector.³⁰

2. Airworthiness Determinations

Typically, an aircraft requires an FAA-issued airworthiness certificate to operate in United States airspace.³¹ In order to receive an airworthiness certificate, the manufacturer must have their designs certified by the FAA—this is called a type certificate—and prove that they can repeatedly build an aircraft that conforms to the design—this is called a production certificate.³² The FAA establishes airworthiness criteria and can issue type certificates for aircraft, aircraft engines, propellers, parts, or appliances.³³ In 2020, the FAA amended 14 C.F.R. Part 21 to add procedural requirements for the issuance of type certificates for special classes of aircraft.³⁴ In the final rule, the FAA explained that it intended the special class category to include, in part, those aircraft that would be eligible for a standard airworthiness certificate but for which certification standards do not exist due to their unique, novel, or unusual design features.³⁵ The BVLOS Aviation Rulemaking Committee (ARC) recommended the FAA consider alternative means to providing airworthiness certification that does not require type and production certification.³⁶

Because UAS can be remotely piloted, unique configurations and applications of airframes, powerplants, fuels, and materials are possible and can result in flight characteristics different from those of conventional aircraft.³⁷ Further, while some UAS components are essential for safe operation, they are not permanent features of the UA.³⁸ Accordingly, these features are the unique, novel, and/or unusual features the special class category was designed to accommodate.³⁹

3. FAA’s Role

Several offices within the FAA are responsible for various approvals for the integration of UAS. However, the complexity of the issues and the agency’s current organizational structure remains a challenge for many applicants. While the FAA’s UAS Integration Office (AUS) is responsible for leading the FAA’s efforts to safely integrate UAS operations into the NAS, it does not have any authority to act on the certification or operational approvals of UAS or their operations.⁴⁰

Since Congress’s 2012 directive to integrate UAS into the NAS, the FAA has only granted five Part 135 air carrier certificates for UAS and type certificated only a single UAS model.⁴¹ The UAS industry’s consensus is that current FAA regulations do not enable UAS operations to scale in an economically viable and effective manner.⁴² To date, the FAA has only type certified one UAS, the Matternet M2—a 29-pound UAS—which took more than four-and-a-half-years for FAA to certify using special class criteria.⁴³ This raises the question from some stakeholders as to whether it is appropriate for a small UAS with limited operations should need to go through the same safety approval processes (Part 21) as a larger transport category aircraft that will be in service for several decades.

²⁹ Michael, Healander, *Cities’ role to play in America’s growing drone economy*, NAT’L LEAGUE OF CITIES (2023), available at <https://www.nlc.org/article/2023/02/17/cities-role-to-play-in-americas-growing-drone-economy/>.

³⁰ See UAS BVLOS ARC, *Final Report*, *supra* note 24.

³¹ 49 U.S.C. §§ 44702(a) & 44704(d) (2023).

³² 14 C.F.R. Part 21 Subpart B (2023); 14 C.F.R. Part 21 Subpart G (2023).

³³ 14 C.F.R. Part 21 (2023).

³⁴ *Id.*

³⁵ *Id.*

³⁶ See UAS BVLOS ARC, *Final Report*, *supra* note 24.

³⁷ See *supra* note 33.

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ FAA, *UAS Integration Office*, available at https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/aus.

⁴¹ See FAA, *FAA-certificated Aircraft Operators (Legal Part 135 holders)*, (last updated Mar. 13, 2023), available at Paul Brinkmann, *Armed with an FAA type certificate, this drone company plans its next moves*, AM. INST. OF AERONAUTICS AND ASTRONAUTICS (Nov. 3, 2022), available at <https://aerospaceamerica.aiaa.org/armed-with-an-faa-type-certificate-this-drone-company-plans-its-next-moves/>.

⁴² See generally UAS BVLOS ARC, *Final Report*, *supra* note 24.

⁴³ See *Airworthiness Criteria: Special Class Airworthiness Criteria for the Matternet, Inc. M2*, 85 Fed. Reg. 74,294 (Nov. 20, 2020) (showing that Matternet applied to the FAA in 2018 for a type certificate); see also Paul Brinkmann, *supra* note 41.

B. ADVANCED AIR MOBILITY—EVTOL & POWERED-LIFT AIRCRAFT

Advances in technology, such as increased battery density and distributed electric propulsion, are allowing for the development of novel aircraft with the potential to be quieter, safe, and sustainable.⁴⁴ These improvements have led to the emergence of new aircraft designs that use advanced propulsion systems to generate lift and thrust including all-electric, hybrid-electric, hydrogen, and hydrogen-electric.⁴⁵ Designs for these aircraft are diverse, but can largely be classified as vertical takeoff and landing (VTOL), short takeoff and landing (STOL), or conventional takeoff and landing (CTOL) aircraft.

New operational and commercial concepts for eVTOLs first received widespread attention in the late 2010s following the publication of an industry white paper discussing on-demand urban air transportation and additional follow-on papers, roadmaps, and research from the National Aeronautics and Space Administration (NASA).⁴⁶ This work led to the development of Urban Air Mobility (UAM) and regional air mobility (RAM) concepts—collectively referred to as advanced air mobility (AAM)—that involve moving people and/or property intracity or intercity by air. A recent industry report projects AAM growth of up to hundreds or even thousands of simultaneous operations within a region at altitudes reaching nearly 5,000 feet.⁴⁷

It is estimated that the AAM industry has the potential to add 234,000 jobs and \$115 billion annually to the United States economy by 2035.⁴⁸ Furthermore, it is estimated the UAM market in the United States is projected to see dramatic and sustained growth for decades to come, reaching a projected \$255 billion by 2040, \$1 trillion by 2045, and over \$2.4 trillion by 2050.⁴⁹

1. Certification & Production

Currently, several eVTOL manufacturers are in discussions with the FAA regarding type certification of their aircraft under Part 21. Most of these manufacturers are in the pre-project familiarization or certification plan stages.⁵⁰ To date, the FAA has published proposed airworthiness criteria for two aircraft in the Federal Register for public comment.⁵¹ Following receipt of airworthiness criteria, an applicant and the FAA must agree on a means of compliance, determine testing and validation plans, and execute those plans. The FAA then issues a Type Inspection Authorization (TIA), the applicant completes their final flight tests and undergoes conformity inspections, and the FAA reviews the manuals associated with the aircraft before certificated operations can occur.⁵² In most cases, this process takes years.

a. FAA's Certification Basis Shift to Part 21.17(b)

In 2011, the FAA chartered an ARC to review and rewrite 14 C.F.R. Part 23 (Part 23), the airworthiness requirements for normal category aircraft, or small aircraft.⁵³ In August 2017, a new set of performance-based rules went into effect.⁵⁴ Several eVTOL aircraft manufacturers going through pre-project and certification planning phases with the FAA expressed a preference to use the industry consensus standards previously accepted under these Part 23 rules to comply with the applicable

⁴⁴ See FAA, NEXT GEN, CONCEPT OF OPERATIONS, V1.0, UAM, 2–4, (June 26, 2020), available at https://wordpress-387766-2876614.cloudwaysapps.com/wp-content/uploads/2020/07/UAM_ConOps_v1.0.pdf.

⁴⁵ VERTICAL FLIGHT SOCIETY, *eVTOL Aircraft Directory* (2023), available at <https://www.evtol.news/aircraft>.

⁴⁶ UBER ELEVATE, FAST-FORWARDING TO A FUTURE OF ON-DEMAND URBAN AIR TRANSPORTATION (Oct. 27, 2016), available at <https://evtol.news/media/PDFs/UberElevateWhitePaperOct2016.pdf>; NASA, *Advanced Air Mobility*, available at <https://www.nasa.gov/aam>.

⁴⁷ Brock Lascara, *Urban Air Mobility Airspace Integration Concepts*, THE MITRE CORP. (June 2019), available at <https://www.mitre.org/sites/default/files/publications/pr-19-00667-9-urban-air-mobility-airspace-integration.pdf>.

⁴⁸ Aijaz Hussain & David Silver, *Advanced Air Mobility—Can the United States afford to lose the race?*, DELOITTE (Jan. 26, 2021), available at <https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/advanced-air-mobility.html>.

⁴⁹ MORGAN STANLEY RESEARCH, *EVTOL/URBAN AIR MOBILITY TAM UPDATE: A SLOW TAKE-OFF, BUT SKY'S THE LIMIT*, (May 6, 2021), available at https://assets.verticalmag.com/wp-content/uploads/2021/05/Morgan-Stanley-URBAN_20210506_0000.pdf.

⁵⁰ Type Certification, FAA Order No. 8110.4C (Mar. 6, 2017) available at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_8110_4C_Chg_6.pdf.

⁵¹ Airworthiness Criteria: Special Class Airworthiness Criteria for the Joby Aero, Inc. Model JAS4-1 Powered-Lift, 87 Fed. Reg. 67,399 (Nov. 8, 2022); Airworthiness Criteria: Special Class Airworthiness Criteria for Archer Aviation Inc. Model M001 Powered-Lift, 87 Fed. Reg. 77,749 (Dec. 20, 2022).

⁵² Order 8110.4, *supra* note 52.

⁵³ 14 C.F.R. § 23 (2023).

⁵⁴ *Id.*

certification requirements.⁵⁵ However, the FAA determined that Part 23 may not adequately account for many of these designs.⁵⁶ Instead, applicants were told the FAA would require a special class airworthiness certificate under Part 21.17(b) and would consider the aircraft as powered-lift aircraft.⁵⁷ Under the procedures in Part 21.17(b), the airworthiness requirements for special class aircraft can be comprised of portions of the requirements in various FAA regulations, including but not exclusively Part 23.⁵⁸ Some stakeholders received this change in approach with consternation, and are concerned the FAA will be challenged to establish criteria and determine a means of compliance for a special airworthiness certificated powered-lift aircraft in a reasonable amount of time.⁵⁹ Based on public statements, it appears the FAA has minimized the disruption for some manufacturers; however, some stakeholders may remain concerned.⁶⁰

b. International Validation

In 2011, the United States and European Union entered into a bilateral aviation safety agreement (BASA).⁶¹ This bilateral agreement facilitated cooperation on airworthiness certification of civil aviation products imported and exported between the two regions.⁶² More specifically, it was intended to (1) promote reciprocal acceptance of safety findings and approvals and (2) leverage the resources and expertise of each certification system.⁶³

Like the FAA, the European Union Aviation Safety Agency (EASA) is using an atypical process to certify eVTOL aircraft called Special Condition VTOL (SC-VTOL).⁶⁴ The novel nature of these aircraft and processes, which were not envisioned in the BASA, among other issues, have raised questions about the feasibility of international validation of eVTOL aircraft in the near-term while maintaining the FAA's approach to certification.⁶⁵

2. Entry into Service

Most eVTOLs are expected to enter service with a pilot on board, flying under visual flight rules (VFR), predominantly using existing infrastructure, communicating with air traffic, fully equipped with automatic dependent surveillance broadcast (ADS-B), and using established flight paths.⁶⁶ Through at least the end of the decade, eVTOL aircraft operators plan to use existing operating procedures and concepts similar to traditional aviation. Doing so will either require an eVTOL aircraft to be added to an existing air carrier operating certificate under Part 135 or the establishment of a new licensed air carrier. Some manufacturers intend to operate

⁵⁵ U.S. GOV'T ACCOUNTABILITY OFF., GAO-22-105020, TRANSFORMING AVIATION: STAKEHOLDERS IDENTIFY ISSUES TO ADDRESS FOR 'ADVANCED AIR MOBILITY' (2022) available at <https://www.gao.gov/assets/gao-22-105020.pdf>.

⁵⁶ *Id.*

⁵⁷ Jessica Reed, *The FAA confirms Changes to Regulatory Approach for powered-Lift Certification*, AVIATION TODAY, (May 26, 2022), available at <https://www.aviationtoday.com/2022/05/26/powered-lift-faa/>.

⁵⁸ Airworthiness Criteria: Special Class Airworthiness Criteria for the Joby Aero, Inc. Model JAS4-1 Powered-Lift, 87 Fed. Reg. 67,400 (Nov. 8, 2022).

⁵⁹ Thom Patterson, *GAMA Has Questions for the FAA About eVTOL Certification*, FLYING MAGAZINE, (June 22, 2022), available at <https://www.flyingmag.com/gama-has-questions-for-the-faa-about-evtol-certification/>.

⁶⁰ Press Release, JOBY, *Joby Completes Second Stage of certification Process*, (Feb. 9, 2023), available at <https://www.jobyaviation.com/news/joby-completes-second-stage-certification-process/>.

⁶¹ Agreement Between the United States of America and the European Community on Cooperation in the Regulation of Civil Aviation Safety, U.S.-E.U., (Dec. 6, 2013), available at https://www.faa.gov/aircraft/air_cert/international/bilateral_agreements/baa_basa_listing/media/EU-US-agreement-R0A5.pdf.

⁶² *Id.*

⁶³ FAA, *The Aviation Safety Agreement Between the US and the EU*, (2011), available at https://www.faa.gov/aircraft/repair/media/EASA_EU_roadshows.pdf [hereinafter *Aviation Safety Slides*].

⁶⁴ EASA, THIRD PUBLICATION OF MEANS OF COMPLIANCE WITH THE SPECIAL CONDITION VTOL-MOC-3 SC-VTOL ISSUE 1 (June 29, 2022), available at <https://www.easa.europa.eu/en/document-library/product-certification-consultations/special-condition-vtol>.

⁶⁵ Cathy Buyck, *EASA To Strengthen Safety Reviews of U.S.-certified Aircraft*, AINONLINE, (Jan. 25, 2021), available at <https://www.ainonline.com/aviation-news/air-transport/2021-01-25/easa-strengthen-safety-reviews-us-certified-aircraft>; THE STANDARDS MANAGEMENT TEAM, AIR, THE SAFETY CONTINUUM—A DOCTRINE FOR APPLICATION, (Sept. 2014), available at https://downloads.regulations.gov/FAA-2015-1621-0018/attachment_1.pdf; Elan Head, *Special Report: The number at the center of an eVTOL safety debate*, THE AIR CURRENT, (Jan. 9, 2023), available at <https://theaircurrent.com/industry-strategy/special-report-evtol-safety-continuum-10-9/>.

⁶⁶ HAI, ROADMAP OF ADVANCED AIR MOBILITY OPERATIONS, (Feb. 2023), available at https://rotor.org/wp-content/uploads/2023/03/HAI_Advanced_Air_Mobility_Report_03072023_pages.pdf.

the aircraft themselves, others plan to both operate and sell aircraft, and others may just sell their aircraft and offer maintenance services.⁶⁷ Several traditional operators plan to purchase these aircraft and bring them onto their existing operating certificate.⁶⁸

a. Regulatory Environment

In order to leverage existing aviation rules for a new class of aircraft, the FAA needs to update its regulations and provide clarity around pilot privileges—including the use of type ratings, privileges of rotorcraft and airplane pilot certificates, instructor qualifications, and establishment of a powered-lift category—around air traffic procedures—including VFR, instrument flight rules (IFR), right-of-way and altitude rules, crew responsibilities, and clearances—and other requirements where powered-lift aircraft are not listed as an allowable user or where regulations are not applicable as written.⁶⁹ In order to meet the target service dates of many eVTOL manufacturers and operators, the FAA has stated it will publish a final Special Federal Aviation Regulation (SFAR) by “the fourth quarter of 2024”.⁷⁰ Additionally, the Department of Transportation (DOT) is in the process of updating its air carrier definitions to include powered-lift.⁷¹

AAM manufacturers and future operators will have to create pilot training programs, recruit instructors and pilots, develop and implement maintenance manuals, and procure insurance, among other requirements.⁷² Most of these activities require continued FAA involvement and approvals.

b. Physical Infrastructure

In addition to existing aviation infrastructure, some AAM concepts are expected to lift off from existing physical infrastructure (e.g., modified parking garage rooftops or retrofitted heliports).⁷³ In September 2022, the FAA published Engineering Brief (EB) 105, guidance for airport sponsors, heliport owners, developers of new infrastructure, states and communities for the design of vertiports.⁷⁴ This guidance was largely based on FAA’s Heliport Design Advisory Circular and was published for industry input.⁷⁵ The FAA maintains that this is an initial step, and they intend to update their guidance after receiving additional operational data from aircraft

⁶⁷ Press Release, JOBY, *Joby Receives Part 135 Certification from the FAA* (May 26, 2022), available at <https://ir.jobyaviation.com/news-events/press-releases/detail/40/joby-receives-part-135-certification-from-the-faa>; Charles Alcock, *Archer Tells Shareholders it is on track with eVTOL Aircraft Development Plans*, FUTURE FLIGHT (Mar. 15, 2022), available at <https://www.futureflight.aero/news-article/2022-03-15/archer-tells-shareholders-it-track-evtol-aircraft-development-plans>; Press Release, ARCHER, *Archer Receives \$10 Million Pre-Delivery Payment From United Airlines For 100 EVTOL Aircraft* (Aug. 10, 2022), available at <https://www.archer.com/news/archer-receives-10-million-pre-delivery-payment-from-united-airlines-for-100-evtol-aircraft-advances-path-to-commercialization>; Press Release, EVE AIR MOBILITY, *United Invests Another \$15 Million in Electric Flying Taxi Market with Eve*, (Sept. 8, 2022), available at <https://eveairmobility.com/united-invests-another-15-million-in-electric-flying-taxi-market-with-eve/>.

⁶⁸ Bristow Group, *Elevated for the Future* (last visited Mar. 1, 2023), available at <https://www.bristowgroup.com/services/advanced-air-mobility>.

⁶⁹ Letter from Jens Hennig, Vice Pres., Operations, Gen’l Aviation Mfrs. Assoc’n (GAMA) and Walter Desrosier, Vice President, Engineering & Maintenance, GAMA to Mr. David Boulter, Assoc. Adm’r, Aviation Safety, FAA, Ms. Lirio Liu, Exec. Dir., Aircraft Certification Service, FAA, & Mr. Larry Fields, Exec. Dir., Flight Standards Serv., FAA (July 21, 2022), available at <https://aerospaceamerica.aiaa.org/wp-content/uploads/2022/09/GAMA22-28-Recommendations-Powered-Lift-SFAR-220721.pdf>.

⁷⁰ Revise Airplane Definition to Incorporate Powered-lift Operations, RIN 2120–AL72, Unified Agenda, Office of Information and Regulatory Affairs; *FAA Reauthorization: Enhancing America’s Gold Standard in Aviation Safety*, Hearing Before the Subcomm. on Aviation of the H. Comm. on Transp. and Infrastructure, 118th Cong. (Feb. 7, 2023) (statement of David Boulter, Acting Assoc. Admin. for Aviation Safety, FAA).

⁷¹ Update to Air Carrier Definitions, 87 Fed. Reg. 74,995 (Dec. 7, 2022).

⁷² 14 C.F.R. § 135 (2023).

⁷³ See Gideon Lichfield, *When Will We Have Flying Cars? Maybe Sooner Than You Think*, MIT TECH. REV. (Feb. 13, 2019), available at <https://www.technologyreview.com/s/612891/when-will-we-have-flying-cars-maybe-sooner-than-you-think/>.

⁷⁴ Memorandum, from Mr. Michael A.P. Meyers, Manager, Airport Engineering Division, FAA, to All Airports Regional Division Managers (Sept. 21, 2022), available at <https://www.faa.gov/sites/faa.gov/files/eb-105-vertiports.pdf>.

⁷⁵ See FAA, *Vertiport Design Engineering Brief Industry Day (Discusses Draft Guidance)*, YOUTUBE (Oct. 11, 2022) available at <https://www.youtube.com/watch?v=1WwJD6XPYQE>.

manufacturers.⁷⁶ This guidance is meant to help relevant entities plan for and design infrastructure to support AAM.⁷⁷ It includes information about required airspace safeguards, touchdown and lift-off area designs, charging capabilities and utility connections, and fire protection systems.⁷⁸ Unlike certified airports, the designs of many general aviation facilities are not regulated by the Federal government.⁷⁹ Instead, they are overseen by state and local regulations that manage land-use and permitting.⁸⁰

To support this effort, several AAM operators have released various vertiport designs and are working with Federal agencies and local governments to design, develop, and deploy these concepts.⁸¹ In December 2022, as part of the Consolidated Appropriations Act, 2023 (P.L. 117–328), Congress passed the *Advanced Air Mobility Infrastructure Pilot Program*, which authorized \$25 million for eligible entities at the state, local, and tribal levels to begin planning for the integration of AAM infrastructure into communities and transportation systems.⁸² Over time, if AAM proliferates as predicted, the FAA's processes and technology, as well as the physical infrastructure supporting these operations, will need to grow and adapt.⁸³

III. WITNESSES

PANEL I

- Mr. Adam Woodworth, CEO, Wing
- Dr. Catherine Cahill, Ph.D., Director, The Alaska Center of UAS Integration, University of Alaska Fairbanks
- Chief Roxana Kennedy, Chief of Police, Chula Vista Police Department
- Dr. Stuart Ginn, M.D., Medical Director for WakeMed Innovations, WakeMed Health and Hospitals

PANEL II

- Mr. Kyle Clark, Founder and CEO, BETA Technologies
- Mr. JoeBen Bevirt, Founder and CEO, Joby Aviation
- Mr. Christopher Bradshaw, President and CEO, Bristow Group Inc., *on behalf of the Helicopter Association International*
- Mr. Clint Harper, AAM Expert and Community Advocate

⁷⁶Presentation, FAA, *Vertiport Design Standards for eVTOL/UAM Vehicles* (Mar. 2, 2021), available at https://www.faa.gov/about/office_org/headquarters_offices/ang/redac/media/airports/2021/march/airports-mar2021-VertiportDesignStandardsforeVTOLUAMVehicles.pdf.

⁷⁷See Memorandum, *supra* note 74.

⁷⁸*Id.*

⁷⁹14 C.F.R. § 139 (2023).

⁸⁰Helicopter Design, FAA, Advisory Circular 150/5390–2D, (Jan. 5, 2023), available at https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_150_5390_2D_Heliports.pdf.

⁸¹See e.g., LILIUM, *Designing a Scalable Vertiport*, available at <https://lilium.com/newsroom-detail/designing-a-scalable-vertiport>; see also, URBAN MOVEMENT LABS, *The Urban Air Mobility Partnership*, available at <https://www.urbanmovementlabs.com/programs-projects>.

⁸²See *supra* note 7.

⁸³UAM AIRSPACE RESEARCH ROADMAP, NASA (Sept. 2021), available at <https://ntrs.nasa.gov/api/citations/20210019876/downloads/NASA-TM-20210019876Final.pdf>.

**FAA REAUTHORIZATION: HARNESSING THE
EVOLUTION OF FLIGHT TO DELIVER FOR
THE AMERICAN PEOPLE**

THURSDAY, MARCH 30, 2023

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

The subcommittee met, pursuant to call, at 10 a.m., in room 2167 Rayburn House Office Building, Hon. Garret Graves (Chairman of the subcommittee) presiding.

Mr. GRAVES OF LOUISIANA. The Subcommittee on Aviation will come to order.

I ask unanimous consent the chairman be authorized to declare a recess at any time during today's hearing.

Without objection, so ordered.

I also ask unanimous consent that Members not on the subcommittee be permitted to sit with the subcommittee at today's hearing and ask questions.

Without objection, so ordered.

As a reminder, if Members wish to insert a document into the record, please also email it to DocumentsTI@mail.house.gov.

I now recognize myself for the purpose of an opening statement for 5 minutes.

**OPENING STATEMENT OF HON. GARRET GRAVES OF
LOUISIANA, CHAIRMAN, SUBCOMMITTEE ON AVIATION**

Mr. GRAVES OF LOUISIANA. I want to thank all of the witnesses for being here today.

How would you feel if you prepared yourself for a marathon over months and months of training, working out really hard, and you get in that race, and you are at mile 26, and all of a sudden, the course just ends? No more arrows pointing you in any direction, no finish line, no ability to actually finish the race and achieve your accomplishment.

I am afraid that is kind of the scenario that we are in today, in that you represent innovators, you represent users of new technology, and you have spent years and years, you have invested extraordinary amounts of dollars, time, and effort, and you haven't actually been able to get to the finish line because we have a Government that doesn't have a process that actually reflects the urgency, we don't have a Government that has a process that is capable of delivering, capable of certifying, capable of approving, capa-

ble of integrating into the airspace new technologies that you and the next panel have created. Products like drones, UAS, products like urban air mobility, these technologies are thwarted now because of the inability of Government to move forward.

Over the past century of flight, the aviation industry has repeatedly proven it can safely introduce advancements that elevate the industry to new heights. Today, we find ourselves at the next transformative point in aviation history. We are seeing the autonomy, alternative sources of power, and new manufacturing processes being applied to aircraft in ways never done before.

This isn't a research project; this isn't "The Jetsons." These capabilities are here today. Again, unmanned aircraft systems (or drones) and advanced air mobility (AAM) aircraft, have the potential to revolutionize our transportation systems and directly improve our daily lives.

Ninety percent of Americans today live within 10 miles, for example, of a Walmart. Today, there are 7 States—36 stores—that are delivering, via drone, products that you can buy online and have it literally delivered to your house within 30 minutes.

As one example of an application where drones can be helpful, during the 2016 floods and Hurricane Laura in 2020 in my home State of Louisiana, drones were used to help do reconnaissance missions, to help do preliminary assessments of damage, and to help identify if people were in need of rescue. This technology was able to be deployed earlier, faster, and safer than alternative platforms. In many cases, the roads were unable to be driven; they were flooded or unpassable. And, in other cases, the weather conditions were still such that putting up aircraft that were piloted was still too dangerous.

Again, drones can solve those issues. And we have some drone users here today that have launched these styles of services that support communities.

Imagine a future where you can travel across town, from city to city, to an airport that is normally out of reach, in just a matter of minutes—bypassing traffic, flying over rivers or other obstacles while flying on a quiet AAM electric aircraft.

Our second panel is transforming what it means to be a small aircraft, taking passenger and cargo flights to the next level, and we will discuss what Congress can do to expedite their commercial operations.

Despite the value provided to the public by both drones and AAM, both of them, as noted, have experienced significant obstacles or hurdles as a result of the lack of predictability and certainty in the regulatory process of the FAA. The FAA's inability to make quick and sound decisions, and stick by those decisions, has resulted in a lack of clarity for new entrants in the market. After over 5 years of trying, the FAA has succeeded in certifying a grand total of one drone.

We are going to hear from Wing today about their efforts to certify a 10-pound drone made of Styrofoam and enumerable roadblocks that have stood in their way. We cannot allow the opportunities these technologies provide to our constituents to be stifled by endless redtape and requests for more data and studies.

And I think, importantly, keeping in mind, look, these technologies aren't going to stop. Just because the United States may not be capable of having a predictable regulatory process in place to facilitate these technologies, it doesn't mean the innovators are going to stop. These people have overcome obstacles their entire lives, and all that's going to happen is that we are going to cede our leadership in aviation technology to other countries, as we are seeing today.

The last thing we need is FAA's lack of leadership and unwillingness to accept new ideas to drive the next great age of aviation out of America. The FAA can be a gatekeeper to the National Airspace System and safely facilitate innovation. The two are not mutually exclusive.

As we hear from today's witnesses, I urge my colleagues to think about how we can provide direction to the FAA, convince the agency to use the flexibilities it has been afforded, and allow for the commercialization of drones and the variety of AAM platforms on the cusp of certification.

While there are complex issues surrounding these technologies, I believe we can find solutions to unlock the full potential of drones and AAM to flourish in America.

[Mr. Graves of Louisiana's prepared statement follows:]

**Prepared Statement of Hon. Garret Graves of Louisiana, Chairman,
Subcommittee on Aviation**

I want to thank all of the witnesses for being here today.

How would you feel if you prepared yourself for a 26.2-mile marathon, training months and months, working out really hard, and you get in that race, you're at mile 26, and all of the sudden, the course just ends? Forget that last .2 miles—you're on your own. No more arrows pointing you in any direction, no finish line, no ability to actually finish the race and achieve your goal.

I'm afraid that's the scenario new entrants into aviation find themselves in—our witnesses today represent innovators, users of new technology, and have spent years investing extraordinary amounts of money, time, and effort, and they haven't actually been able to get to the finish line because we have a government that doesn't have a process and doesn't reflect any urgency in developing one.

We don't have a process that's capable of delivering, capable of certifying, capable of approving, or capable of integrating new technologies into the airspace.

Products like drones and Advanced Air Mobility are technologies which are thwarted because of the inability of government to move forward.

Over the past century of flight, the aviation industry has repeatedly proven it can safely introduce advancements that elevate the industry to new heights. Today we find ourselves at the next transformative point in aviation history.

We are seeing the autonomy, alternative sources of power, and new manufacturing processes being applied to aircraft in ways never done before. This isn't a research project. This isn't "The Jetsons." These capabilities are here today.

Again, Unmanned Aircraft Systems (UAS, or more commonly referred to as "drones") and Advanced Air Mobility (AAM) aircraft have the potential to revolutionize our transportation systems and directly improve our daily lives.

Ninety percent of Americans today live within 10 miles, for example, of a Walmart. And today, there are seven states—36 stores—that are delivering Walmart products via drone. But why aren't there more?

As one example of an application of where drones can be helpful—during the 2016 floods and Hurricane Laura in 2020 in my home state of Louisiana, drones were used to help do reconnaissance missions, to help do preliminary assessments of damage and to help identify if people were in need of rescue.

This technology was able to be deployed earlier, faster, and safer than alternative platforms. In many cases, the roads were unable to be driven—they were flooded or unpassable. And in other cases, the weather conditions were still such that putting up piloted aircraft was still too dangerous.

Again, drones could help solve these issues. And we have some drone users here today that have launched these styles of services that support communities.

Imagine a future where you can travel across town, from city to city, to an airport that is normally out of reach, in just a matter of minutes—bypassing traffic, flying over rivers or other obstacles while flying on a quiet AAM electric aircraft.

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The FAA's inability to make quick and sound decisions, and stick by those decisions, has resulted in a lack of clarity for new entrants in the market.

After over five years of trying, the FAA has succeeded in certifying a grand total of one drone.

We're going to hear from Wing today about their efforts to certify a 10-pound drone made of Styrofoam and the innumerable roadblocks that have stood in their way.

We cannot allow the opportunities these technologies provide to our constituents to be stifled by endless red tape and requests for more data and studies.

Importantly, keep in mind these technologies aren't going to stop. Just because the United States may not be capable of having a predictable regulatory process in place to facilitate these technologies, it doesn't mean the innovators are going to stop. These people have overcome obstacles their entire lives, and all that's going to happen is that we're going to cede our leadership in aviation technology to other countries—and unfortunately, we're seeing that today.

The last thing we need is the FAA's lack of leadership and its unwillingness to accept new ideas to drive the next great age of aviation out of America.

The FAA can be the gatekeeper to the National Airspace System (NAS) and facilitate innovation—the two are not mutually exclusive.

As we hear from today's witnesses, I urge my colleagues to think about how we can provide direction to the FAA, convince the agency to use the flexibilities it's been afforded, and allow for the commercialization of drones and the variety of AAM platforms on the cusp of certification.

While there are complex issues surrounding these technologies, I believe that we can find solutions to unlock the full potential of drones and AAM to flourish safely in American airspace.

Mr. GRAVES OF LOUISIANA. With that, I yield to the ranking member of the full committee, Mr. Larsen.

Mr. LARSEN OF WASHINGTON. Thank you very much, Mr. Chair, for indulging the order here. I think we are both headed to the floor to manage some debate. So, I appreciate that.

OPENING STATEMENT OF HON. RICK LARSEN OF WASHINGTON, RANKING MEMBER, COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

Mr. LARSEN OF WASHINGTON. Thanks for calling today's hearing today on dealing with drones and with AAM.

Nearly 10 years ago, this committee first explored the safe integration of new airspace entrants, including uncrewed aircraft systems—or UAS or drones—and advanced air mobility aircraft—or AAM—into the National Airspace System. What was considered aviation technology of the distant future is happening now, and these innovative technologies are rapidly emerging in U.S. skies.

According to the FAA, there are more than 872,000 registered UAS in the United States, of which nearly 339,000 are registered for commercial operations. In my home State of Washington, UAS will soon be used to deliver critical medical supplies in the Tacoma area through a partnership between Zipline and MultiCare Health System, helping to reduce barriers to care for patients.

Further, according to industry projections, more than 200 companies worldwide are developing eVTOL—electric vertical takeoff and landing—aircraft, with potential applications ranging from cargo transport to alternative passenger mobility options.

While the potential benefits of these advanced aviation technologies are promising, the upcoming FAA reauthorization bill must continue to prioritize aviation safety while also ensuring U.S. innovation leads globally.

The FAA's mission is to ensure the safest aerospace system in the world, a task that is growing more complex due to new airspace entrants. In 2012, Congress required the FAA to develop a comprehensive plan to accelerate the safe integration of civil UAS into the NAS—or the National Airspace System.

Since then, the FAA has issued final rules to expand potential commercial activities, including permitting the operation of small UAS, commonly referred to as part 107; remote identification, or remote ID; and the operation of small UAS over people. More recently, the FAA announced a self-imposed deadline of December 2024 to issue a rule on AAM certification standards and operating requirements.

Unfortunately, however, the FAA's path to safely integrating new entrants was challenging, with organizational inefficiencies, prolonged delays, and unpredictable waiver and approval processes.

So, although the FAA must reassess and recommit itself to addressing these issues, in no way should the agency or Congress jeopardize the safety of the traveling public to do so. This means working with the FAA and key aviation stakeholders to implement an appropriate Federal regulatory framework to allow these industries to scale, so the U.S. can remain the leader in aviation safety and innovation.

With each passing year as well, climate change continues to be a growing threat to millions of Americans. Electric and hydrogen propulsion systems employed by many UAS and AAM aircraft rely on low- and zero-emission technologies, which have the potential to significantly reduce the harmful impacts of greenhouse gases and of noise.

A recent NASA study found that Joby's eVTOL aircraft measured noise levels during takeoff and landing below 65 dBA, which is comparable to normal conversation, at a distance of 330 feet from the flightpath. I certainly would be interested to hear what others in the industry can say about their platforms as well.

And so, Congress must robustly invest in the research to leverage the environmental benefits of these technologies, especially for communities disproportionately affected by the carbon and noise emissions of traditional aircraft.

The development and deployment of new entrants also presents opportunities for job creation in the U.S. According to industry projections, the AAM sector is expected to generate an estimated 280,000 jobs by 2035.

Additionally, drones can be used to support critical work that would otherwise be unsafe or difficult for people and crewed aircraft to perform on their own. For instance, the Arizona Department of Transportation uses small UAS to examine hard-to-reach areas in canyons and across large waterways to help supplement

their inspections, which is why my colleague, Representative Greg Stanton of Arizona, led the bipartisan House passage of the Drone Infrastructure Inspection Grant Act last Congress to fund State, local, and Tribal governments' use of UAS in certain circumstances.

To further harness this technology for the American people, we must better equip the next generation of the U.S. aviation workforce with the skills necessary to compete globally and to use these technologies.

Although getting through type certification is the main goal for many UAS and AAM industries, it cannot be the only objective. Congress, the FAA, and industry must have early and meaningful engagement with local communities to ensure their priorities and any potential concerns are adequately addressed, which is why Congress enacted my bill, along with Chair Graves, the Advanced Aviation Infrastructure Modernization Act, to help State and local communities begin to plan for future AAM operations and the infrastructure needed to support it.

But there clearly is more work to do. With safety as the guiding principle, the 2023 FAA reauthorization is an opportunity to support U.S. innovation, foster sustainability, and improve U.S. global leadership.

So, I want to thank today's witnesses on both panels for coming today, as far away as Alaska. I appreciate that. And I look forward to examining how Congress, the FAA, local communities, and the aviation industry can support the safe and efficient integration of these new airspace entrants.

With that, I yield back.

[Mr. Larsen of Washington's prepared statement follows:]

**Prepared Statement of Hon. Rick Larsen of Washington, Ranking Member,
Committee on Transportation and Infrastructure**

Thank you, Chairman Graves, for calling today's hearing "FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People."

Nearly ten years ago, this committee first explored the safe integration of new airspace entrants, including uncrewed aircraft systems (UAS or drones) and advanced air mobility (AAM) aircraft, into the national airspace system (NAS).

What was once considered aviation technology of the distant future is happening now, and these innovative technologies are rapidly emerging in U.S. skies.

According to the Federal Aviation Administration (FAA), there are more than 872,000 registered UAS in this country, of which nearly 339,000 are registered for commercial operations.

In my home state of Washington, UAS will soon be used to deliver critical medical supplies in the Tacoma area through a partnership between Zipline and MultiCare Health System, helping to reduce barriers to care for patients.

Furthermore, according to industry projections more than 200 companies worldwide are developing electric vertical takeoff and landing (eVTOL) aircraft, with potential applications ranging from cargo transport to alternative passenger mobility options.

While the potential benefits of these advanced aviation technologies are promising, the upcoming FAA reauthorization bill must continue to prioritize aviation safety, while also ensuring U.S. innovation leads globally.

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A recent National Aeronautics and Space Administration (NASA) study found that Joby's eVTOL aircraft measured noise levels during take-off and landing below 65 dBA, which is comparable to normal conversation, at a distance of 330 feet from the flight path.

Congress must robustly invest in critical research to leverage the environmental benefits of these technologies, especially for communities disproportionately affected by the carbon and noise emissions of traditional aircraft.

The development and deployment of new entrants also presents opportunities for job creation in the U.S.

According to industry projections, the AAM sector is expected to generate an estimated 280,000 jobs by 2035.

Additionally, drones can be used to support critical work that would otherwise be unsafe or difficult for people and crewed aircraft to perform on their own.

For instance, the Arizona Department of Transportation uses small UAS to examine hard-to-reach areas in canyons and across large waterways to help supplement their inspections.

Which is why my colleague, Representative Greg Stanton of Arizona, led the bipartisan House passage of the Drone Infrastructure Inspection Grant Act last Congress, to fund state, local and Tribal governments' use of UAS in certain circumstances.

To further harness this technology for the American people, we must better equip the next generation of U.S. aviation workforce with the skills necessary to compete globally.

Although getting through type certification is the main goal for many in the UAS and AAM industries, it cannot be the only objective.

Congress, the FAA and industry must have early and meaningful engagement with local communities to ensure their priorities and any potential concerns are adequately addressed.

Which is why Congress enacted my bill with Chairman Garret Graves, the Advanced Aviation Infrastructure Modernization Act, to help states and local communities begin to plan for future AAM operations and the infrastructure needed to support it.

But it is clear there is more work to do.

With safety as the guiding principle, the 2023 FAA reauthorization is an opportunity to support U.S. innovation, foster sustainability and improve U.S. global leadership.

Thank you again to today's witnesses. I look forward to examining how Congress, the FAA, local communities and the aviation industry can support the safe and efficient integration of these new airspace entrants.

Mr. COLLINS [presiding]. Thank you, Mr. Larsen.

I now recognize Ranking Member Cohen for 5 minutes for an opening statement.

**OPENING STATEMENT OF HON. STEVE COHEN OF TENNESSEE,
RANKING MEMBER, SUBCOMMITTEE ON AVIATION**

Mr. COHEN. Thank you, Mr. Chair.

I look forward to hearing from our esteemed panel of witnesses today, both of the panels, on the integration of new aircraft, such

as uncrewed aircraft systems, which gives us a new acronym, UAS, or drones; and electrical vertical takeoff and landing, another new acronym, eVTOL, electrical vertical taking and landing aircraft. These are new into our lexicon and our national airspace.

Both drones and advanced air mobility, or AAM, have the potential to both change how we travel and how we transport goods and services. This is especially true in my district, home to Federal Express and the Memphis International Airport, one of the busiest cargo airports in the world because of FedEx and the work that they have done.

In 2018, the Memphis International Airport was selected by the Department of Transportation to participate in its UAS Integration Pilot Program. The airport partnered with the city of Memphis, the University of Memphis, the Tennessee Department of Transportation, FedEx of course, and others to test advanced drone operations in five different airspaces, including within the airport perimeter.

Some of the practical applications that were tested and demonstrated included precision agriculture, remote aircraft and runway inspections, commercial package delivery, night flight operations, and emergency response and remote medical device deployment.

Upon successful conclusion of the 3-year program, the Memphis Airport and FedEx were selected by the FAA for its new drone program, BEYOND—an acronym, I am sure, but not one that I have been told yet. This program focuses on working toward operating under established rules rather than waivers, collecting data to develop performance-based standards, collecting and addressing community feedback, streamlining the approval processes for drone integration, and more.

The most recent drone flight operations took place over the FedEx ramp, with the goal of detecting foreign object debris to enhance airfield safety and conducting security inspections along the airport perimeter fence line to supplement existing security systems and protocols. To date, the Memphis Airport and the FedEx team have flown approximately 2,000 successful drone flights.

I applaud the University of Memphis FedEx Institute of Technology's focus on drone research and appreciate its potential to have a major economic impact on our region.

As we will hear from our witnesses today, we have much work to do to ensure that FAA's regulatory framework adequately supports the evolving aviation sector and prevents the United States from falling behind on UAS integration.

I look forward to learning more about how our subcommittee can support the evolving advanced air mobility sector, which has the potential to move people and cargo between places previously not served or underserved by traditional aviation or emergency vehicles.

I look forward to healthy discussions from those experienced with AAM concepts to shed further light on how to better support this growing sector. We need to be especially conscious of working with the communities to integrate these new operations into the transportation systems, and ensure they have a voice in the room as we get closer to implementation. I am sure some will complain about

vehicles flying over their backyards, invading their privacy, et cetera.

With attention being shifted towards accommodating and embracing two new entrants into our national airspace, the AAM and drones at the forefront, we must be vigilant and conscientious with our efforts to ensure that aviation safety remains a top priority, not only for those in the air, but also for those on the ground.

I look forward to this, but I remember the first day somebody told me about these things [holds up cell phone]. And this was about 30 years ago, I guess. And I said he was nuts. Well, he wasn't nuts. He was a little bit ahead of me. And the same thing for these drones. It is kind of amazing we will be flying around—and it will be like “The Jetsons”—in the air.

This, I don't know what this is here. It looks to me like a Spruce Goose of the 21st century. It is pretty bizarre.

But, anyway, I look forward to working with Chairman Graves, Acting Chairman Collins, our colleagues, our witnesses here today, and other stakeholders on the next FAA reauthorization bill.

And I yield back the balance of my time.

[Mr. Cohen's prepared statement follows:]

**Prepared Statement of Hon. Steve Cohen of Tennessee, Ranking Member,
Subcommittee on Aviation**

Thank you. I look forward to hearing from our esteemed witnesses on both panels today as we examine the integration of new aircraft—such as uncrewed aircraft systems (UAS) or drones and electric vertical takeoff and landing (eVTOL) aircraft—into our national airspace.

Both drones and advanced air mobility or AAM, have the potential to both change how we travel and how we transport goods and services.

This is especially true in my district, home to Federal Express and Memphis International Airport, one of the busiest cargo airports in the world because of FedEx and the work they have done.

In 2018, the Memphis airport was selected by the Department of Transportation to participate in its UAS Integration Pilot Program.

The airport partnered with the City of Memphis, the University of Memphis, the Tennessee Department of Transportation, FedEx and others to conduct advanced drone operations in five different airspaces, including within the airport perimeter.

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This program focuses on working toward operating under established rules rather than waivers, collecting data to develop performance-based standards, collecting and addressing community feedback, streamlining the approval processes for drone integration and more.

The most recent drone flight operations took place over the FedEx ramp with the goal of detecting foreign object debris to enhance airfield safety and conducting security inspections along the airport perimeter fence line to supplement existing security systems and protocols.

To date, the Memphis Airport and FedEx team have flown approximately 2,000 successful drone flights.

I also applaud the University of Memphis FedEx Institute of Technology's focus on drone research and appreciate its potential to have a major economic impact on our region.

As we will hear from our witnesses here today, we have much more work to do to ensure that FAA's regulatory framework adequately supports this evolving aviation sector and to prevent the United States from falling behind on UAS integration.

I also look forward to learning more about how our Subcommittee can support the evolving advanced air mobility sector, which has the potential to move people and cargo between places previously not served or underserved by traditional aviation or emergency vehicles.

I look forward to healthy discussion from those experienced with AAM concepts to shed further light on how to better support this growing sector. We need to be especially conscious of working with the communities who integrate these new operations into their transportation systems, and ensure they have a genuine voice in the room as we get closer to implementation.

With attention being shifted towards accommodating and embracing new entrants into our national airspace, with AAM and drones at the forefront, we must be vigilant and conscientious with our efforts to ensure that aviation safety remains a top priority for not only those in the air, but also those on the ground.

I look forward to working with Chairman Graves, our colleagues, our witnesses here today and other stakeholders on the next FAA reauthorization bill.

Mr. COLLINS. Thank you, Mr. Cohen.

We've got a rookie at the wheel, I am just going to be upfront with you. But, anyway, if anything goes wrong, we are going to blame this young man to the right of me here.

Today we have two panels. Currently the witnesses before us are the first panel that we will be hearing from today. The focus of the first panel is the operations of small unmanned aircraft systems.

So, I would like to welcome our witnesses and thank them for being here today.

That being said, y'all, we are experiencing some technical difficulties with our timing system, just in time for the rookie to take over. So, I ask unanimous consent that staff be allowed to utilize a stopwatch as a timer for today's events.

Without objection, so ordered.

So, today, please look at the staff behind me. A green square means go, a yellow square means you are running out of time, and a red square means wrap up your remarks.

I also ask unanimous consent that the witnesses' full statements be included in the record.

Without objection, so ordered.

As your written testimony has been made part of the record, the subcommittee asks that you limit your oral remarks to 5 minutes.

And prior to beginning witness testimony, I would like to make our witness panel aware that votes are anticipated to be called at 10:30 this morning. When this occurs, we will enter a brief recess. However, witnesses should be prepared to resume the hearing when the subcommittee reconvenes.

With that, Mr. Adam Woodworth, you are recognized for 5 minutes for your testimony.

TESTIMONY OF ADAM WOODWORTH, CHIEF EXECUTIVE OFFICER, WING AVIATION LLC; CATHERINE F. CAHILL, Ph.D., DIRECTOR, ALASKA CENTER FOR UNMANNED AIRCRAFT SYSTEMS INTEGRATION, UNIVERSITY OF ALASKA FAIRBANKS; ROXANA KENNEDY, CHIEF OF POLICE, CHULA VISTA POLICE DEPARTMENT; AND STUART GINN, M.D., MEDICAL DIRECTOR, WAKEMED INNOVATIONS, WAKEMED HEALTH AND HOSPITALS

TESTIMONY OF ADAM WOODWORTH, CHIEF EXECUTIVE OFFICER, WING AVIATION LLC

Mr. WOODWORTH. Thank you.

Chairman Graves, Ranking Member Cohen, members of the Aviation Subcommittee, thank you for holding this hearing today on the important issue of integrating new entrants into our airspace. And thank you to the staff for helping prepare the hearing. I am truly honored to be here to testify.

My name is Adam Woodworth. I am offering my testimony today as CEO of Wing, a company that has developed small UAS, most commonly referred to as drones, to deliver small packages. I joined Wing in 2014 as an aircraft designer, rising to CTO in 2018, and assuming the role of CEO last year.

Aviation has long been a passion of mine. I grew up flying model airplanes with my dad. That led directly to a career in aviation and studies in aerospace. Today I try to pass along that fascination to my two young daughters, who join me out at the flying field most weekends.

Flight is a magical yet often rare experience. Most people don't remember the first time they were in a car, but many can remember the first time they flew on an airplane or interacted with aviation.

The technologies and industries discussed today have the opportunity to fundamentally change that, lowering traditional barriers to entry and introducing more people than ever to the world of aviation and its benefits.

At Wing, we have developed a lightweight, highly automated aircraft to deliver small packages to customers, as well as a suite of UAS traffic management capabilities to help operators share the airspace safely. We partner with retail merchants to deliver goods ranging from over-the-counter medications to household essentials and meals.

Today, Wing has been approved to operate in five countries, including Australia, Ireland, Finland, Switzerland, and the United States, with locations in the DFW area and in Christiansburg, Virginia.

We are the first drone company to receive a part 135 air carrier certificate, which enables beyond visual line-of-sight operations. To date, we have completed over 300,000 commercial deliveries to consumers in our service areas, and we have done so safely.

I really love aviation, but that is not why I believe in the promise of our mission and in this industry. Simply put, the sheer volume of goods being transported is ever-increasing, and consumer demand for fast, efficient, cost-effective delivery has taken root. I be-

lieve the best, most efficient, and safest way to get those goods to consumers is via drone.

There has long been widespread recognition of the potential of this technology. What I would like to stress in this hearing is that that technology exists now, and it is ready for use today.

For numerous reasons—benefits to our consumers, benefits to businesses, our Nation’s global aviation leadership—we urgently need a regulatory framework that better allows for its adoption. This committee clearly has a role to play in this, and at Wing and across the industry, we urge timely action on the topic this year.

I have submitted my written testimony with a number of recommendations for the committee to consider. These recommendations are consistent with the BVLOS ARC report submitted last year, which will help broadly advance commercial operations and enjoys consensus support from the drone industry.

I would like to focus on a few of those priorities now.

Overall, we need an approach from the FAA for the safe integration of drones into the national airspace that is both predictable and pragmatic.

The FAA has a capable and dedicated workforce, and we recognize the challenges of trying to apply decades of experience in regulating large passenger aircraft to new, vastly different technology. The result, however, is that our industry has faced unpredictable timelines with lengthy delays and confusing or often contradictory guidance from across the organization about what the FAA needs to see in order to issue approvals.

Quite simply, we are stuck. And a more predictable and pragmatic approach to these lower risk, nonpassenger-carrying operations would help break up these logjams.

The good news is, we don’t have to start from scratch. With the work that the drone industry and the FAA have done together, we have a foundation to build upon in the following ways.

First, Congress could help by directing the FAA to establish a clear and objective target level of safety for drones. The FAA has done this for other categories of aircraft, and the drone industry needs a clear set of standards to work to.

Second, Congress could help by directing the FAA to adopt a declarative certification and design approval approach for small UAS, modeled after the agency’s existing light-sport aircraft certification process. Under this process, the FAA will set specific safety thresholds, and manufacturers will build to and then declare compliance with those standards. Throughout this process, the FAA would retain the ultimate safety and compliance oversight of each applicant.

Third, the United States needs an open and cooperative airspace environment. We should not overlook the benefits to a cooperative, interoperable, and open environment for crewed and uncrewed aircraft. LAANC, ADS-B, industry-built, regulator-approved UTM are all real-world examples of how technology built to standards can improve safety and bring efficiencies to our airspace.

In conclusion, at Wing, we believe the National Airspace System is an asset that everyone should have access to and everyone should benefit from. There is more than enough room in the sky

for everybody, and that includes passenger airliners, general aviation, model aircraft, and drones.

[Mr. Woodworth's prepared statement follows:]

Prepared Statement of Adam Woodworth, Chief Executive Officer, Wing Aviation LLC

INTRODUCTION

Chairman Graves, Ranking Member Cohen, members of the Transportation and Infrastructure Committee, thank you for holding this hearing today on the important issue of integrating new entrants into our airspace. I am honored to testify.

My name is Adam Woodworth, and I am offering testimony today as the CEO of Wing, a company using uncrewed aircraft systems (UAS), commonly referred to as "drones," to deliver small packages. I joined Wing in 2014 as an aircraft designer, rising to Chief Technology Officer in 2018, and assuming the role of CEO one year ago.

Begun in 2012 as Project Wing within X (at the time known as Google X), Wing has developed a highly automated aircraft to deliver small goods to customers, as well as a set of UAS Traffic Management (UTM) capabilities to help operators share the airspace. We partner with merchants such as Doordash and Coles Supermarkets to deliver goods ranging from over-the-counter medicine and household essentials to made-to-order meals, coffee drinks, and even ice cream. In 2018, Project Wing became an independent company—still under the Alphabet umbrella—called Wing Aviation.

Today, Wing has been approved to operate in five countries on three continents. Our most mature and high-volume operations are in Canberra and Logan City, Australia. We also have locations in Finland, Ireland, and the United States—around the Dallas-Fort Worth metroplex and in Christiansburg, Virginia. Wing holds relevant approvals in each jurisdiction and we were the first drone company to receive a Part 135 air carrier certificate for commercial UAS delivery operations beyond visual line of sight (BVLOS). To date, we have successfully completed over 300,000 commercial deliveries to paying customers.

AIRCRAFT AND COMMERCIAL OPERATIONS

At Wing, we fundamentally believe that it should require fewer resources to transport a two-ounce bottle of medicine to someone's home than it does to deliver a large order of groceries. But today, because of our reliance on a single mode of transportation for virtually all residential deliveries, these two orders would likely be carried by similar vehicles, requiring similar resources, taking up similar space on our roadways, and emitting similar levels of pollution into our atmosphere. The reason we want to use drones for delivery is because it allows you to right-size the vehicle for the payload.

By right-sizing the delivery vehicle to the goods being delivered—such as using an eleven-pound, battery-powered drone mostly made of plastic and styrofoam to deliver a three-pound package instead of a two-ton car or truck—drone delivery can bring efficiency, safety, and environmental benefits to communities across the country and the world.

Wing has developed a hybrid fixed-wing and multirotor aircraft that cruises like an airplane but launches and lands vertically with a series of hover rotors. The aircraft is lightweight, electric, highly automated, and designed specifically for delivery in populated areas. Safety is paramount and Wing has designed the aircraft to deliver a level of safety that exceeds any alternative mode of ground transportation.

Wing operates BVLOS in populated areas along flexible or "on-demand" routes. At the delivery zone, Wing aircraft hover at roughly 23 feet above ground and gently lower the package via tether. Delivery zones are typically backyards, driveways, or other small clearings. Wing also distributes flight paths across the operating area, where possible, to minimize repeat overflights.

Wing operates in low-utilization airspace below 400 feet over populated areas. For crewed traffic, we engage with local aviation stakeholders, Wing's remote pilots monitor ADS-B, and today we also utilize visual observers of the airspace in the United States. Further, Wing issues a NOTAM and monitors local frequencies. For uncrewed traffic, Wing has demonstrated strategic deconfliction between different UAS through a network of interoperable UAS Service Suppliers (USS).

Wing has invested an incredible amount of time, brain power, and resources into developing and proving out a system that is capable of serving millions of customers in populated areas across the globe. We are anxious to see the FAA adopt a regulatory framework that will enable us to bring the benefits of this promising technology to communities across the country and maintain our leadership in the field of emerging aviation technology.

FAA REAUTHORIZATION

In the 2012 FAA reauthorization bill, Congress provided the first and fundamental direction to the FAA to treat these vehicles as aircraft. It was eleven years ago that Congress directed the FAA to safely integrate UAS into the National Airspace System (NAS). The dedicated civil servants at the FAA are hardworking and deserve praise for doing something new. But Congress can and should equip the FAA with the policy direction and regulatory tools to make safe operation of commercial drones scalable in the United States.

The FAA reauthorization process provides a perfect opportunity to do just that. Congress has acted in the past to give direction to the FAA and that led to the successful adoption of commercial flight approvals under Section 333 of the 2012 FAA bill, and adoption of the broader commercial drone operations regulation in Part 107. Congress also played a role in pushing the FAA to adopt regulations allowing for operations over people.

We appreciate Congress setting the policy direction for the FAA to implement, and there is more work ahead. Below are what I view as priorities necessary to advance commercial UAS integration in the United States for this Committee to consider for inclusion in the FAA reauthorization bill this year.

BVLOS Rulemaking

The UAS industry is well-positioned and evolving quickly to enable BVLOS operations, but the 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, with the ARC's recommendations published by the FAA in March 2022. Broadly enabling BVLOS operations in a safe and secure manner is critical to unlocking the benefits of using drones for many commercial and public safety tasks. It will also foster new job opportunities within the industry.

The FAA must prioritize taking action to enable BVLOS operations by putting forth a Notice of Proposed Rulemaking. But the process of developing a final rule can take months, even years, to complete. The FAA currently has the opportunity to adopt a more *predictable* and *pragmatic* approach to UAS regulation by moving forward with a BVLOS rule. Congress should direct timely action on this rule-making effort.

Congress can also demonstrate its commitment to further advancing this industry by directing the FAA to take such action under current authorities, specifically Section 44807 of Title 49, United States Code, as a way of marking progress while a more comprehensive rulemaking process unfolds.

Target Level of Safety | Acceptable Level of Risk

As part of enabling routine operations, including BVLOS, the FAA must prioritize the determination of an acceptable level of risk—or a calculable, objective target level of safety—for UAS operations consistent with existing accepted general aviation risks. Taking this step will give operators clear design targets and allow them to produce a detailed framework for building a suitable safety case to meet the target level of safety and take into account the specific needs for their operations while allowing the FAA to assess whether the operator meets their high bar for safety. This would add much-needed consistency to the process and reduce the arbitrary subjectivity and excessive delays currently experienced by operators.

Congress should include language in the FAA reauthorization to require the FAA to adopt and publish a quantified target level of safety for UA operations that is modeled upon and consistent with existing accepted general aviation risks.

UAS Certification

Despite multiple years of industry working with the FAA to receive type certificates for small UAS, the FAA has issued only a single type certificate out of the numerous UAS submissions pending, failing to keep pace with technology due to internal delays and inefficiencies. While the FAA has engaged in a multi-year internal debate regarding how to appropriately tailor a type certification process designed for crewed aircraft to low-risk small UAS, the agency has received, considered, and approved type certificate petitions for much larger, passenger-carrying crewed aircraft.

Moving forward, Congress could help by directing the FAA to adopt a declarative certification for aircraft design approval for small UAS, modeled after the FAA's existing and successful light-sport aircraft certification process. Under this process, the FAA will adopt risk-appropriate consensus standards and manufacturers will then build to and declare compliance with those standards. Throughout the process, the FAA would retain ultimate safety and compliance oversight of each applicant.

Equipage & Modernization

With the introduction of more and different types of aviation, both crewed and uncrewed, the airspace is truly maturing to serve more users. This innovation provides promising opportunities to benefit communities across the country, and will usher in the adoption of novel technology solutions capable of maintaining the safety of the NAS, particularly in very low altitude airspace (below 500' AGL).

In order to safely and efficiently share this airspace, it is incumbent upon all of us to adopt existing, effective, and affordable mitigations to avoid collisions with other aircraft. Outside of airspace designations for particular uses, technologies such as ADS-B have been proven to enhance safety. These technologies are widely available, have been successfully in use for years in other portions of our national airspace, and are affordable to purchase and install. Most importantly, the use of ADS-B technologies saves lives: a recent study found that it reduces airborne collisions for general aviation and air taxi aircraft by 53 percent and air collision fatalities by 89 percent¹.

At Wing, our pilots monitor ADS-B signals from crewed aircraft and we install ADS-B receivers on our aircraft as we work toward FAA approval of on-aircraft automated avoidance. But to truly create a cooperative environment and continue to improve the safety of the airspace, adoption rates across the board need to increase. For that reason, we believe Congress should provide incentives for legacy aircraft, possibly through restoring the ADS-B Rebate program, to adopt this reliable, effective, and affordable technology that can save lives and enable entirely new kinds of aviation to develop, integrate, and thrive in our national airspace.

UTM

Another key element of an open and cooperative airspace environment is UAS Traffic Management (UTM). The concept of UTM—an interoperable, cooperative and collaborative approach to airspace safety and efficiency in low-altitude airspace—was embraced by the U.S. Government and is being built by industry. Thanks to significant contributions from industry, academia, and government involvement, global standards development organizations have developed standards that regulators and industry have adopted to create operational UTM services. These services are seeing their earliest implementation in Europe where regulations have created the opportunity to broadly deploy UTM services and enable wide-scale operations.

It is imperative that the FAA also recognize industry standards and enable industry to utilize UTM services such as strategic deconfliction to create a safer, and more accessible airspace for all operators. Congress should require the FAA to adopt industry standards for strategic deconfliction and allow companies to utilize interoperable technology that meets this standard in their operations.

Environmental Reviews

Drones are an environmentally friendly technology powered by electrification that can contribute to curbing emissions by taking vehicles, including delivery trucks, off the roads. Yet, the current backlog of environmental reviews threatens to stall progress on UAS deployment and operations in the United States and further hamper the industry's competitive edge—leading to frustration for stakeholders and dissatisfaction for customers.

The FAA should move towards looking at broader geographic areas—or programmatic reviews—for UAS operations, not on a case-by-case basis for one specific area or operator as is the current process. This will help streamline the approval process for operators—especially in potential areas of deployment that share similar characteristics, wildlife, and topography.

Congress should include language directing the FAA to streamline environmental approvals of advanced UAS and encourage the FAA to move toward programmatic reviews.

¹Howell, Daniel and King, Jennifer. *Measured Impact of ADS-B In Application on General Aviation and Air Taxi Accident Rates*. 38th Digital Avionics Systems Conference, September 2019.

FAA Realignment

The UAS Integration Office is the focal point for all matters relating to UAS integration policy. Historically, the majority of the FAA's institutional knowledge related to UAS has resided within this office. However, approvals for UAS operations largely exist outside of the purview of the Integration Office.

To meet the needs of the NAS, authority for the approval of UAS should rest with the experts within the FAA who best understand this form of aviation and how it will correspond with other aircraft operators and have the responsibility to safely integrate UAS into the national airspace. The existing approval process is not designed to accommodate the current evolution of aircraft design and capability.

Congress should enable the FAA to take a more direct approach with the hundreds of thousands of new aircraft operators and stakeholders in the NAS, by elevating and empowering the UAS Integration Office to streamline and improve existing approval processes within the FAA's organizational structure.

Specifically, Congress should include language in the FAA reauthorization to create a position of Associate Administrator to oversee UAS operations and certification, and provide that person with the authority to actually approve UAS and their operations, while ensuring appropriate consultation with other lines of business within the FAA.

It is also important to note here that this effort should be focused. Wing is excited about recent developments with Advanced Air Mobility, or air taxis, and we look forward to seeing more progress in the integration of that technology. But make no mistake about it—from a regulatory standpoint, the risk assumptions and regulatory timelines are vastly different. Most prominent in the safety analysis is that there is not a person onboard a drone—it makes no sense to regulate our uncrewed, 11-pound styrofoam drone to the same regulatory specification or timelines as a large vehicle that carries passengers.

Extending and Improving Section 44807

Section 44807 of Title 49—the special authority for certain UAS—is currently scheduled to expire September 30, 2023. It has been a crucial enabler for the airworthiness of small UAS and must be extended in order to continue and expand part 135 UAS operations. If this authority is not extended, BVLOS operations in the United States will essentially cease, which will have wide-ranging ramifications on the UAS industry itself as well as the partners and customers that we serve. It will prevent the delivery of health items, critical infrastructure inspection, and many other benefits that BVLOS operations provide.

In extending Section 44807 authority, Congress should also take the opportunity to make improvements to it. Getting a 44807 exemption currently is a lengthy and burdensome process where each application has to go through the rulemaking process, including a notice and comment period. Congress should clarify that the FAA need not apply the Part 11 exemption procedures, and Section 44807 approvals can be issued without undergoing a full rulemaking process.

These improvements are crucial to seeing near-term progress in advancing UAS integration here in the United States as the FAA works toward a final BVLOS rule.

Network Remote ID

Remote identification of UAS is a security tool required by the United States Government for operation by providing a “digital license plate” for nearly all UAS operating in the NAS. A Remote ID system can give law enforcement, security officials, and the general public necessary information about a nearby UAS, which may help to ensure operations are safe and secure.

Although international standards bodies have concluded that Remote ID can effectively be accomplished through two different means—either broadcast signal (based on radio frequency) or network (based on internet connectivity)—the FAA's final rule on Remote ID determined only broadcast, not network, technology would comply with the rule. This stands in direct contrast to other regions of the world. In Europe, for example, UAS operators flying in designated “U-space” airspace are required to employ network identification.

Network identification has important advantages, from offering greater privacy protections to serving as a cornerstone to data exchange paradigms that enable UTM. To further the development of network identification, the FAA must allow UAS industry stakeholders to demonstrate that the goals of the remote identification rule can be achieved in a technology-agnostic manner, as long as required performance standards are met.

Congress should include language in the FAA reauthorization to require that the FAA develop an additional means of compliance to the remote identification requirements that can accept internet-based network identification as an acceptable means

of compliance with rules requiring UAS be equipped with technology to allow for remote identification.

CONCLUSION

In conclusion, at Wing we believe that the National Airspace System is a crucial asset to which everyone should have access and from which everyone should benefit. Simply put, there is room in the airspace for everyone. That should include passenger airliners, general aviation, model aircraft, and yes, even drones.

Drones are an important entry point for people of all ages and from all backgrounds into the world of aviation. Most people do not remember the first time they rode in a car, but many remember the first time they flew on an airplane. Aviation has traditionally been a rare and somewhat exclusive experience. Drones can help change that. I am an avid RC aircraft hobbyist, and I am excited about passing that passion along to my young daughters. The barriers to entry are so much lower for influencing and even employing people with drones than with traditional aircraft. The development of the drone industry is a critical tool in broadening and diversifying the aviation workforce.

Drones also have a lot to offer the economy, and each day of delay threatens the future of this industry here in the United States. We appreciate Congress's attention to advancing this innovation platform, and all of its novel uses, here in the United States.

I am happy to answer any questions you may have. Thank you.

Mr. COLLINS. Thank you.

The Chair now recognizes the gentlelady from Alaska, Mrs. Peltola, for 1 minute to introduce our next witness.

Mrs. PELTOLA. All right. Thank you, Mr. Chairman. I appreciate the leeway here.

It is my great honor to be able to recognize one of my constituents who is here as a panelist today. Dr. Cathy Cahill is the director of the Alaska Center for Unmanned Aircraft Systems Integration, or ACUASI—another good acronym—and is a full professor of atmospheric chemistry at the University of Alaska Fairbanks.

Dr. Cahill's education background includes degrees in applied physics for her bachelor's degree and atmospheric sciences for her master's and Ph.D. She also researched transatlantic aerosol transport during a Fulbright Fellowship to Ireland for her post-doc.

For many years, her research focused on the sources, transport, transformation, and impacts of atmospheric aerosols, including the effects of atmospheric aerosols on soldiers in Iraq and Afghanistan, and the long-range transport of pollution from China into the Arctic.

In order to measure the altitude of aerosols crossing the Pacific Ocean, Dr. Cahill started designing aerosol samplers for unmanned aircraft.

After a 2014–2015 sabbatical to Washington, DC, in which she served as a congressional fellow to the United States Senate Committee on Energy and Natural Resources, Cathy returned to the University of Alaska Fairbanks and became the director of ACUASI, which is regarded as a national leader in UAS research.

Dr. Cahill, I really want to thank you so much for coming all the way to DC to share your expertise with us. I know it is a long trek. And I really look forward to hearing what you have to share with us today.

Thank you, Mr. Chairman.

Mr. COLLINS. Thank you, Mrs. Peltola.

Now, Dr. Cahill, you are recognized for 5 minutes for your testimony.

**TESTIMONY OF CATHERINE F. CAHILL, Ph.D., DIRECTOR,
ALASKA CENTER FOR UNMANNED AIRCRAFT SYSTEMS INTE-
GRATION, UNIVERSITY OF ALASKA FAIRBANKS**

Ms. CAHILL. Mr. Chairman, Ranking Member, and members of the Aviation Subcommittee, my name is Cathy Cahill. And as the Representative just stated, I am the director of—

Mr. COLLINS [interrupting]. Ma'am, do you mind turning your mic on?

Ms. CAHILL. OK. Got it. Thank you.

I am the director of the Alaska Center for Unmanned Aircraft Systems Integration at the University of Alaska Fairbanks. ACUASI is the University of Alaska's Center of Excellence for drones and is one of the top drone research programs in the country.

However, the testimony I am giving today is in my personal capacity as a private citizen and based on my professional experience. It does not necessarily reflect the views of the University of Alaska.

ACUASI leads one of the seven FAA-designated UAS test sites and one of the eight FAA BEYOND program partnerships. ACUASI is a core university in the FAA's Center of Excellence for UAS Research, also known as the Alliance for System Safety of UAS through Research Excellence, or ASSURE. More acronyms.

As a result, we are engaging with the best and brightest civil and governmental agencies and entities to develop and implement cutting-edge drone technologies, support research, help the FAA collect and analyze data to support the safe integration of drones, and developing the workforce pipeline needed to support the drone industry.

The ACUASI team is primarily composed of people who live in the aviation-focused State of Alaska, and we see daily use cases where drones can positively impact aviation safety. Currently, Alaska has the highest number of pilots, traditional aircraft, and drones per capita, as well as the highest rate of aircraft fatalities.

Many infrastructure surveillance activities that could be conducted via drone are being conducted using pilots and observers flying in difficult conditions. Most of us know pilots and observers who have been injured or killed conducting animal surveys or monitoring pipelines.

Additionally, more than four out of every five Alaskan communities are only reachable year-round by air. We do not have a last-mile delivery problem like Wing. We have a last-hundreds-of-miles delivery problem. Diapers, milk, medical supplies, and other necessities need to get to our villages, and that is a real challenge. So, being able to deliver these supplies and goods on a more regular basis using drones will greatly improve the quality of life in these communities, while improving aviation safety by removing a pilot from those risky missions.

We are also working to advance safety technologies and practices that are applicable to both drones and traditional aviation.

Combined, these facts uniquely position me to raise some critical factors for your consideration in the 2023 reauthorization bill. Some of the most important issues are:

We need to extend the seven FAA test sites authorizations for another 5 years. Currently, they expire on September 30, 2023.

We need to be able to codify the new 49 U.S. Code 44803(c) waivers that are finally beginning to allow the test sites to conduct civil operations to assist companies in meeting the test and evaluation required for drones under 300 pounds to become type-certified.

Additionally, we need to codify the ability for the test sites to do the same in the future for drones over 300 pounds.

We need to be very careful in terms of expanding the test site program by standing up new test sites. Instead, provide funding to the current test sites to bring additional operational areas across the country into the already established test site program that has a proven safety record. We already can do this with the authorities we have. The Alaska test site has done this at locations across the country.

Please extend the FAA's BEYOND program beyond its current expiration date of October 25, 2024.

Please provide the universities associated with ASSURE cost-match relief. Right now, a 1-to-1 match is prohibiting greater participation in the program.

And please extend the ASSURE program for an additional 10 years to leverage the experience we have.

A key issue here is that we need to expand the FAA's counter-drone authority beyond the airport environment to ensure that we do not interfere with the safety of the entire national airspace safety system.

And, please, we need to be able to provide the FAA with the research exemption to allow the purchase of foreign-made drones for destructive—repeat: blowup—testing during counter-drone system tests. The FAA needs to prove that these systems are effective at removing all drones being flown in a nefarious or hazardous manner from our airspace without impacting national airspace security systems.

We need to update the current rules and regulations to allow for drone technology to enter the airspace, but please do not create them from scratch.

These are a few of my recommendations for the reauthorization bill. Thank you very much for allowing me to be here, and please see my written testimony for additional information.

[Ms. Cahill's prepared statement follows:]

Prepared Statement of Catherine F. Cahill, Ph.D., Director, Alaska Center for Unmanned Aircraft Systems Integration, University of Alaska Fairbanks

Chairman Graves, Ranking Member Cohen, and Members of the Subcommittee, my name is Cathy Cahill and I am the Director of the Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) at the University of Alaska Fairbanks (UAF). ACUASI is the University of Alaska's Center of Excellence for UAS and one of the top UAS research programs in the country. ACUASI is unique in that it has multifaceted roles as lead of one of the seven FAA designated UAS Test Sites and one of the eight BEYOND sites, and a core university in the FAA's UAS Center of Excellence (a.k.a. the Alliance for System Safety of UAS through Research Excellence—ASSURE). As a result, our team is engaged with the best and brightest commercial and governmental entities on cutting-edge UAS technologies, helping FAA collect and analyze the data needed to support the safe integration of UAS into the National Airspace System (NAS), and developing the workforce pipeline that will produce the engineers, scientists, pilots, cargo handlers, drone mechanics, and other jobs needed by UAS end users, operators, and providers to support the developing

drone economy. Being in Alaska allows us to safely test new technologies, policies, and procedures in a state that is dependent upon aviation to conduct missions of import such as long-distance cargo delivery to remote communities, medical supply delivery, long linear infrastructure surveillance, mapping and surveying, and mammal monitoring. Our diverse portfolio and academic standing allows us to demonstrate, observe, and evaluate the risks associated with UAS use in both military and civil environments. Our community and professional relationships enable us to safely advance UAS and aviation technologies. Combined, these facts uniquely position me to raise some critical factors for consideration in the 2023 FAA Reauthorization. This written testimony is provided to you through my personal capacity as a private citizen and based on my professional experience; it does not necessarily represent the views of the University of Alaska.

Alaska is an aviation state (<https://dot.alaska.gov/stwdav/>). We have the highest number of pilots, traditional aircraft, and drones per capita in the country and 82 percent of all Alaskan communities can only be reached year-round via aircraft. Please let me restate this fact for emphasis: more than four out of five communities in Alaska are dependent on year-round aviation. Any improvements we make to the routine servicing of these communities has a direct impact on the quality of life of the residents in those communities. Routinely transporting cargo, such as diapers and milk, to the communities might not be an exciting operation, but it greatly improves the quality of life in that community by reducing cost and increasing access to fresh foods and other necessities. We also have a large number of aviation accidents and fatalities (<https://www.adn.com/alaska-news/aviation/2019/11/04/rate-of-alaska-fatal-plane-crashes-tops-national-average/>), so aviation safety is of serious concern in the state. Many missions, including pipeline surveillance, mapping, animal counting, and cargo delivery, are currently being done using traditional aircraft which can be dangerous. These could be more safely and efficiently conducted using drones flying Beyond the Visual Line of Sight (BVLOS) of their pilots, if a reasonable set of technologies and policies and procedures can be developed and implemented by: the drone community, the larger aviation community, and Federal regulators. Improving aviation safety while improving the quality of life in Alaska's remote communities is why ACUASI has been working for years with partners, especially the State of Alaska Department of Transportation and Public Facilities and those remote communities. Collectively we work to develop concepts of operations for conducting these missions, work with aircraft manufacturers and technology providers to identify and implement new technology based solutions to meet the challenges of safely flying BVLOS. We also work directly with regulators such as the FAA and the Federal Communications Commission to develop the policies, procedures, and permissions required to conduct these operational missions. Our ceaseless efforts in advancing and enhancing aviation safety in Alaska have led to the following realizations and are the foundation to my recommendations for the 2023 FAA Reauthorization legislation.

THE FAA UAS TEST SITES

The FAA and Congress have not funded, granted permissions, or utilized the current seven FAA UAS Test Sites to their fullest potential. The intent of Congress behind the seven FAA-approved UAS Test Sites appears to have been for the Test Sites to assist companies with the research, development, test, and evaluation of new drone technologies and the safe integration of that technology into the National Airspace System (NAS); however, when the Test Sites were stood up, their scope was constrained to conducting public aircraft operations as identified in 49 U.S. Code § 40125:

49 U.S. Code § 40125—Qualifications for public aircraft status

(2) Governmental function.—

The term “governmental function” means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research, or biological or geological resource management.

This requirement greatly limited the ability of the Test Sites to assist commercial operators with the testing and evaluation required to certify their aircraft. As soon as an aircraft was no longer a prototype being used for aeronautical research, the Test Sites could not help the company fly the aircraft and develop the hours needed for the manufacturer to demonstrate the safety of the aircraft in the NAS. The seven Test Sites are safety-focused and are uniquely skilled and positioned to facili-

tate this safe transition. Additionally, the FAA interpreted this requirement as a definitive list of public aircraft operations, instead of as a ‘such as’ list that could be added to, so the Test Sites and other public aircraft users were not allowed to conduct infrastructure (e.g., roads, bridges, etc.) monitoring by state Departments of Transportation, training of drone users, demonstrations of the technology for potential public use cases, and other operations.

The public aircraft restriction also meant that the Test Sites could not charge companies for flights; the Test Sites could only charge for providing assistance in accessing operational airspace, such as applying for the permissions required for the company to fly in a specified airspace, and the use of their facilities. Because the Test Sites did not receive any direct funding from Congress or the FAA to develop those facilities, it was a struggle for all of the Test Sites to develop the facilities required for their customers to do their required testing. Congress has since directed limited funding for research at the Test Sites, but they are required to go to a Qualified Commercial Entity through a Broad Agency Announcement competition process that results in the Test Sites receiving a small portion of the funding allocated to the project for very specific and limited support. I recommend providing the Test Sites with baseline funding to support their facilities and facilitate safer, easier access and support for drone manufacturers and technology providers.

In spite of the public aircraft and funding limitations, the Test Sites have collected important aviation safety data on new aircraft and technologies, including Detect and Avoid (DAA) technologies that will allow a drone to spot other aircraft in the air and autonomously avoid them. Additionally, after many years of requesting relief from the public aircraft limitation and Congressional and State pressure on the FAA, on February 6, 2023, the FAA’s University of Alaska UAS Test Site finally received the first 49 U.S. Code § 44803(c) waiver that allows the Alaska Test Site to conduct civil operations for the test and evaluation of drones under 300 pounds and charge for their efforts. Between February 6 and March 24, 2023, three of the other six Test Sites also received U.S. Code § 44803(c) waivers and the other Test Sites are expected to get their waivers in the near future. These waivers allow the Test Sites to finally do what they should have been allowed to do for vehicles of this size when they were stood up ten years ago. The industry is now expanding into aircraft that are heavier than 300 pounds and the Test Sites are the logical, safe place for this testing as well. We currently are working with aircraft manufacturers developing aircraft of this size or converting traditional cargo aircraft to autonomous systems. The Test Sites are currently only authorized through September 30, 2023, and should be extended by at least five years to continue their important work and fully implement the capabilities available using the 44803(c) waiver to help companies get their drones and drone technologies certified for use in the NAS.

I have heard rumors that organizations are requesting the expansion of the FAA UAS Test Site program. I strongly disagree with that premise. The current Test Sites have established and proven procedures, repeatable operations, and proven safety records that are unmatched in the industry and will be difficult to match for any new Test Site. Additionally, the current Test Sites have not been supported financially by the FAA in spite of our good partnership with the FAA Test Site Program Managers and our provision of quality data sets to the FAA and adding additional sites will make that problem more acute, especially since new Test Sites could potentially be immediately provided with the waivers that the current Test Sites just received after years of hard work. Further, there is a risk that this would dilute the already limited funding coming through the Qualified Commercial Entity program. In addition, if Congress wants to expand the integration of drones into the NAS, including operating flights at the height of the Chinese surveillance balloon or above, altitudes that could be used to expand cellular communications capabilities, support disaster response, collect weather data sets and more; the current Test Sites have experience in these flight regimes and could increase their capacity to support customers and partners interesting in operating at these altitudes. We can also expand our operations to support those regions and entities that desire to be test sites through the processes and procedures we use to operate our ranges in Oregon and Hawai‘i. These were set up after the Test Site authorizations were granted to the University of Alaska for the entire Pan-Pacific UAS Test Range Complex instead of for Alaska, Hawai‘i, and Oregon separately. We have been using these policies and procedures to bring additional operational areas across the country into the University of Alaska UAS Test Site. All seven current Test Sites have the ability to do this. This additional scope and support would require additional funding and/or through our ability to charge for 44803(c) test and evaluation support.

We also recommend that the term ‘governmental function’ in 49 U.S. Code, Section 40125 be redefined to: 1) allow the FAA’s Test Sites collect data on and oversee the research, development, test, and evaluation (i.e., aeronautical research) of all

drones, not just those for Federal government use without requiring a 44803(c) waiver to be able to conduct civil operations, and 2) allow infrastructure inspections, public demonstrations, training and education, and all other activities that are in the public interest that are not currently considered ‘public operations’ but are in the public’s interest. Suggested wording changes are highlighted in red:

49 U.S. Code § 40125—Qualifications for public aircraft status

(2) Governmental function.—

The term “governmental function” means an activity undertaken by a government, such as national defense, intelligence missions, firefighting, search and rescue, law enforcement (including transport of prisoners, detainees, and illegal aliens), aeronautical research (including data collection on civil systems undergoing research, development, test, or evaluation at a FAA UAS Test Site), or biological or geological resource management, infrastructure inspections, public demonstrations, training and education, and all others that are in the public interest.

BEYOND

The FAA’s BEYOND program provides eight state, local, or tribal-led teams with assistance in navigating the regulatory and technical challenges associated with conducting BVLOS operations. In Alaska, the BEYOND program supports our long, linear infrastructure monitoring (e.g., the Trans-Alaska Pipeline), medical supply delivery, and large drone cargo delivery between remote communities efforts. In addition to providing technical and regulatory support to allow us to fly safe, pioneering missions in these three mission areas, the BEYOND program is quantifying who our stakeholders are and how we are engaging with them to best determine how to move the public and other stakeholder, such as the General Aviation community, acceptance of drones forward as drones increasingly enter the NAS. This program is a benefit to the all elements of the aviation community as it addresses the safe integration of drones flying BVLOS in the NAS using real-world operations as the use cases and quantifies the economic benefits of routine drone operations. BEYOND should be continued beyond its current expiration date of October 25, 2024.

FAA’S UAS CENTER OF EXCELLENCE (A.K.A. THE ALLIANCE FOR SYSTEM SAFETY OF UAS THROUGH RESEARCH EXCELLENCE—ASSURE)

The ASSURE program has been conducting quality aviation safety research that leverages the expertise of the universities and identified partners. ASSURE research efforts support a broad cross section of technical research areas for the FAA by bringing teams of subject matter experts, technologists, and researchers together to focus on key FAA-identified knowledge gaps. For example, important ASSURE research includes studies on the effects of drones impacting people and other aircraft, the effectiveness of different detect and avoid technologies in spotting traditional aircraft and drones in the NAS, how to effectively integrate large drone cargo and urban air mobility platforms into airport infrastructure and the potential economic impacts of those technologies as they are adopted. The research products resulting from these studies are centered on improving safety and providing inputs for new guidance and regulations.

The ASSURE universities receive funding through the program, which has been a major advantage to our participation in ASSURE, but the program requires a 1:1 cost match that is difficult for many schools to meet. The ASSURE program is requesting relief from the cost match requirement to allow greater participation in the program. The program also is seeking a ten-year, no-compete extension to be able to leverage the infrastructure, national and international partnerships, and expertise developed by the ASSURE team during the current research efforts into long-term research support and success for the FAA.

REMOTE IDENTIFICATION

Remote Identification (a.k.a., Remote ID or RID) is the ability of a drone to provide identification information to other parties during flight. The Remote Identification of Unmanned Aircraft Final Rule is a new regulation (Part 89 in Title 14 of the Code of Federal Regulations) requiring all drone operators to buy a drone with standard RID equipment on it, equip their drone with a module that will broadcast an RID signal, fly at a FAA-Recognized Identification Area, or seek special author-

ization to operate the drone without an RID starting on September 16, 2023. Remote ID provides law enforcement and other agencies with information on the location of a drone's ground control station, and hence the location of the operator, of a drone that appears to be flying in a reckless or illegal manner. ACUASI team members are concerned about the safety of our drone operators in cases where we are flying legally, but an anti-drone person receives our Remote ID signal and intercepts our users in a hostile manner.

COUNTER-UAS

Unmanned aircraft systems have a tremendous potential to increase aviation safety by doing the dirty, dull, and dangerous flights that currently put pilots at risk, improve cargo delivery to remote areas, deliver packages quickly, effectively and economically, provide broadband communications to remote areas, improve maritime domain awareness, facilitate Search and Rescue, assist law enforcement, monitor infrastructure, and a host of other positive use cases. However, it has been demonstrated that drones also can be used to conduct war, disrupt airports, commerce and transportation, support terrorism, and conduct other nefarious acts. Therefore, the U.S. needs to develop, test, and implement safe counter-UAS (C-UAS) technologies that will allow the discrimination between authorized drones, unauthorized drones, and traditional aviation and allow the safe removal of rogue drones from the NAS by authorized individuals.

Counter-UAS technologies have the potential to adversely impact authorized drones, traditional aircraft, people or property on the ground, and/or safety systems in the NAS. As a result, the authority for conducting C-UAS activities has been limited to five agencies (i.e., DOD, DOE, DHS, DOJ, and the FAA) to ensure the highest levels of safety and security while protecting the public, drone operators, and others from potential collection and misuse of personally-identifiable information. The testing of C-UAS technologies, including some of the detection and tracking systems, has been limited due to their potential violation of sections in Title 18 U.S.C. including the Pen/Trap Statute, the Wiretap Act, the Aircraft Sabotage Act, the Computer Fraud and Abuse Act, and others, and in 49 U.S.C., under Aircraft Piracy. Additionally, countermeasure technologies themselves are frequently classified due to their value to national security. Therefore, the number of companies able to test C-UAS technologies is limited and requires the participation of one of the entities listed above to access restricted airspace and deploy the countermeasures. Remote ID will increase C-UAS technology's effectiveness by providing information on the locations of all authorized drones in an area, thereby allowing security officials to separate authorized drones from unauthorized drone, but rogue drones most likely will not be broadcasting RID signals or broadcasting false signatures, so other forms of C-UAS detection, tracking, and identification are needed.

The FAA's authority has been limited to the testing of potential C-UAS systems at five airports. This is not sufficient for the FAA to understand the effects of the C-UAS systems on the range of safety systems, such as First Responder communications systems and navigational aids, deployed across the NAS, or in non-airport locations including critical infrastructure. The FAA needs to be given a wider authorization to allow it to test these systems away from airports without the need to partner with another agency, which may have a different agenda for the testing, and a duplicative approval process that slows down testing approvals. Additionally, the agencies that have full C-UAS authorities should have their authorities renewed for a longer period of time.

C-UAS researchers need be able to purchase a wide, representative variety of the types and configurations of the drones most commonly used in the NAS to effectively test the ability of C-UAS systems to detect, track, identify, and/or mitigate those drones. The tested drones need to include aircraft made by foreign manufacturers on the list of banned organizations because those aircraft make up a large portion of all drones registered and flown in the U.S. The FAA and the FAA UAS Test Sites involved in current and upcoming C-UAS testing need an exemption from the ban on the purchase of those aircraft so they can support the C-UAS system testing and evaluation by providing the systems with challenges from the most common types of drones found in the NAS.

ACUASI, as a UAS Test Site, BEYOND site, ASSURE member, etc., has yet to test mitigation systems due to our not having the authority to do so. However, we have conducted DAA testing, which is very similar to the detection and tracking piece of C-UAS, and we are partnering with organizations possessing the authorities to support the research necessary to determine the safety of the systems in the NAS. We need to test these technologies in Alaska due to our extreme environ-

mental conditions, large number of General Aviation and commercial aircraft that could be affected by a C-UAS system, and our proximity to Russia.

RIGHT OF WAY RULES

ACUASI has been participating in efforts, such as the BVLOS Aviation Rule-making Committee (ARC), to establish the right of way rules for drones, especially those operating under 400 feet above ground level (AGL), the focus of the BVLOS ARC, Integration Pilot Program, and other efforts. We believe that most of the long-distance drone flights that will be conducted in Alaska will occur at altitudes above 400 feet AGL due to improved satellite, radar, ADS-B, and other navigational and communications availability and safety of flight (e.g., terrain avoidance) if the communications link is lost. However, our team believes that we must participate in the low-altitude operations discussion to ensure that Alaska's aviation interests are protected. As an example, many drone operators are pushing for the airspace below 400 feet AGL to be set aside for BVLOS drone operations without a DAA requirement by stating that no one flies under 400 feet AGL. Anyone who has spent any time flying around Alaska knows that many Alaskans, especially General Aviation pilots, fly under 400 feet AGL. They also know that pipelines, railroad tracks, and other infrastructure serve as navigational aids during deteriorating weather, which conflicts with some potential infrastructure shielding proposals. In the rest of the country, agricultural aircraft (a.k.a. crop dusters) and helicopters routinely fly at these altitudes and some visual routes at high density airports are at these altitudes. Additionally, on approach to Sacramento Metropolitan Airport, I observed a crop duster fly below high-tension power lines, which would not be allowed under potential shielding proposals.

The ACUASI team believes that the current rules and regulations are a good starting point for discussing what a fully-integrated NAS should look like. There are some rules and regulations that need to be updated to allow for drone technology to enter the airspace with traditional aircraft, but in our opinion, we should keep what currently works and make minor modifications to fix what does not, not create new regulations from scratch.

As an example of a regulation that needs to be fixed is the 'see and avoid' clause of 14 C.F.R. § 91.113(b). Currently, no drone can meet the regulations for avoiding other aircraft in the airspace as written in this clause. According to the FAA, the word 'see' in 14 C.F.R. § 91.113(b) cannot be met using any method other than a human eye onboard an aircraft. The FAA's concern is that if an aircraft loses link with the ground control station, then streaming video would cease and the pilot would not be able to see any aircraft near the drone. Additionally, there can be significant time lags in streaming video that could result in an aircraft not being spotted until a collision cannot be avoided. Therefore, we recommend the following wording change to allow for the deployment of an on-aircraft system that can autonomously spot other aircraft in the air and avoid them.

General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to **see** and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

to:

General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to **detect** and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

This paves the way for using DAA technology onboard the drone to help the drone give way to the traditional aircraft and maintain well clear. Onboard DAA technology also could be added to traditional aircraft with designs that limit the pilot's sight to keep them from colliding with aircraft they cannot see or to all aircraft to prevent distracted pilots from flying into other aircraft as has happened across the U.S., including several accidents in Alaska. Additionally, onboard DAA technology prevents the aircraft from violating well clear even if the link between the ground control station and the aircraft is lost, a distinct possibility in the challenging com-

munications link conditions found in Alaska. Onboard DAA is a major stepping stone to safe, fully-integrated drone operations in Alaska. The FAA should fund significant DAA test and evaluation efforts to ensure the development of a small, light-weight DAA systems that operate in all conditions and are able to fit on a small drone without significantly decreasing the ability of that drone to carry a payload.

Some other major stepping stones to safe, fully-integrated drone operations are improved weather information, enhanced communications (e.g., satellite communications, cellular communications, etc.), and fused airspace information displays. These technologies could provide the backbone for the integration of large drone cargo and passenger transport, a.k.a. Advanced Air Mobility (AAM), with traditional aviation between remote communities in Alaska and for locations across the country. The FAA, FCC, National Weather Service, and other Federal agencies need to provide the State of Alaska and other organizations funding to allow for the build-out of the infrastructure required to implement such a system and build Alaska's future transportation system.

WORKFORCE DEVELOPMENT

Last, but by no means least, ACUASI is working to develop the workforce needed to support the incoming drone economy. As the University of Alaska, and in conjunction with Science, Technology, Engineering, and Mathematics (STEM) providers across Alaska, ACUASI is encouraging young minds, as well as the minds of military personnel transitioning to civil life, traditional pilots looking to retire from a life in the cockpit, and all others, to consider a career in a drone-related endeavor. We are developing curricula for people to get certified in drone operations or to achieve a degree in aerospace engineering. More importantly, we also are identifying what new jobs are going to be required to support the field in the future. For example, currently the pilots who fly cargo into our remote communities unload the aircraft. In the future, we will need personnel to assist in the loading and loading of the cargo drone. We also will need drone mechanics, business owners, insurers, programmers, safety inspectors, and a host of other professionals. We will need to train scientists, real estate agents, cinematographers, and teachers how to use the technology. We need payload developers and data analysts to analyze the data from novel payloads. There is an entire workforce associated with drone technology and its uses.

The potential for the drone economy to be transformative in the State of Alaska is tremendous. I am excited that this cutting-edge technology may allow residents of Alaska's remote communities, often Alaska Natives who have lived in their communities for generations, to remain in the place they love and still have a high-tech career. The kids that our team engages during outreach events in these communities may no longer have to choose between their community and fast-paced, technological jobs. They see that no matter what their interests are, they will be able to participate in the drone economy. This will help alleviate the Alaska brain drain to the continental U.S. Additionally, students from across Alaska understand the value of aviation in their lives and bring that to the drone economy. They understand aviation safety and how drones can further that endeavor. We need to make sure that students, whether traditional or non-traditional, from across the U.S. see how they can participate in this up and coming field. Funding for outreach and training is essential for developing this workforce. The impact of the STEM efforts funded by ASSURE are a great example of how a single entity, ASSURE, can positively impact a wide variety of students including under-represented populations and show them the potential for a future in drones. This same impact can be felt in similar communities across the country. This is an inspiration model for our next generation and efforts of this type need to be funded throughout the FAA.

In summary, Alaska is the logical place for the safe testing and implementation of drones for uses of import to Alaskans and the rest of the U.S. population. We have a need for drones. We have minimal ground hazards. We have a population that understands aviation and aviation safety. And we have a program, ACUASI, that is leading the way to safe drone integration in the NAS. Thank you for your help in making our efforts come to fruition across our great country.

This ends my prepared statement and I would be happy to answer any questions you might have.

Mr. COLLINS. Thank you.

Next, Chief Roxana Kennedy, you are recognized for 5 minutes for your testimony.

TESTIMONY OF ROXANA KENNEDY, CHIEF OF POLICE, CHULA VISTA POLICE DEPARTMENT

Ms. KENNEDY. Thank you.

Good morning, Chairman and Ranking Members of the committee, it is an honor to be here today.

My name is Roxana Kennedy, and I am the chief of police for the Chula Vista Police Department. I have been in law enforcement for over 30 years, and I lead an agency with over 400 sworn and civilian personnel. Chula Vista is the second largest city in San Diego County, with 52 square miles and a population of approximately 275,000 residents.

My organization has developed an innovative and strategic way to respond to emergency calls for service despite low staffing and a growing community. These are two real concerns for law enforcement agencies.

My goal today is to highlight the tremendous value of uncrewed aerial systems in law enforcement operations and how drones benefit and keep communities safer.

In 2018, Chula Vista Police Department was selected as the only law enforcement agency to participate as a part of the FAA's Integration Pilot Program, and the same year we launched our Drone as First Responder program, commonly known as DFR.

For those of you who aren't aware or familiar with the concept of DFR, let me explain.

Our drones are stationed on one of five strategically placed rooftops throughout the city, with a pilot in command at each location for airspace awareness.

Inside the police department, in our DFR operations center, we have an experienced sworn officer, also known as a teleoperator, who can launch and control any of the drones at a moment's notice. When someone calls dispatch and needs help, our teleoperator selects the closest drone to respond.

Once overhead, the teleoperator essentially becomes the incident commander and directs responding officers or fire personnel to that emergency and provides critical information to those on scene.

Additionally, the drone footage is livestreamed to police and fire personnel to provide real-time information.

Our drones are responding to actual calls, not randomly patrolling our city. In the past 5 years, we have flown over 14,000 successful missions. And for the first time in 10 years, we have met our priority 1 response time, largely due to DFR. Our average response time is just under 2 minutes.

In police work, we don't have a crystal ball. We never know what we will encounter. And there can be unpredictable consequences. Let me give you an example of a DFR success story.

There was a call for service to a local taco shop in our city. Multiple calls came in from frightened patrons reporting a man sitting at a table waving a gun around acting strangely. His behavior was concerning, and based upon details, we were unsure whether the subject was under the influence or experiencing a mental health crisis.

Our teleoperator launched a drone and was able to arrive on scene within 1 minute and started providing invaluable information to responding officers.

As the teleoperator watched from above, he noticed at one point the subject moved the gun toward his mouth. The concern was this person was going to commit suicide. Instead, the subject placed a cigarette in his mouth and then lit the cigarette with what appeared to be a gun. You could clearly see him now puffing on the cigarette and blowing smoke in the air.

In reality, it was a cigarette lighter, not a gun. This information was provided to responding officers, creating a clearer picture in their minds, which changed their response.

A traditional police response to this call could have ended tragically because of limited information. The ability to view the scene before officers arrived saved lives. This is by far the best deescalation tool I have seen in my law enforcement career.

Our staff maneuvered through the FAA regulations, navigated the COA process, worked through technology issues, and has fought tooth and nail at times to keep our program going with no funding.

While our relationship and support with the FAA team has been amazing, there are some things the FAA can do to better assist law enforcement agencies implementing a DFR program.

The application process for COAs and waivers provides little to no feedback of what needs correction. Understanding early on what is needed would help streamline the process. Better communication from the FAA to applicants on delays in the process will be immensely beneficial.

Recently, the FAA approved a complete BVLOS authorization for another agency's DFR program. This approval is a huge step and a win for law enforcement agencies. However, the FAA's inconsistencies regarding COAs and waiver approvals creates confusion. We recommend the recent approval of what some call the digital visual observer become a standard option for COAs, hence removing the remote-pilot-in-command requirement.

As we build upon the future of drones in law enforcement, we recognize and value protecting public privacy, securing safely the data we collect, and maintaining transparency.

In closing, drones are not a replacement for officers; they are an enhancement. Drone technology is crucial in keeping our officers, our community, and the subjects we contact safer.

Thank you for the opportunity to share our story today, and I look forward to your questions.

[Ms. Kennedy's prepared statement follows:]

Prepared Statement of Roxana Kennedy, Chief of Police, Chula Vista Police Department

INTRODUCTION

Good morning, Chairman Graves, Ranking Member Cohen, and committee members. Thank you for the opportunity to talk with you today about FAA reauthorization and harnessing the innovation of Flight to Deliver for the American People. I cannot think of a better time to highlight the innovation of drone technology and how law enforcement's use benefits the safety and security of the American public.

I am the Chief of Police of the Chula Vista Police Department located in California. The City of Chula Vista is a beautiful city located in the southern portion of coastal San Diego County. It is the second largest city in the county, and boasts more than 52 square miles of coastal landscape, canyons, rolling hills, mountains,

quality parks, and miles of trails. Our southern edge of the city is only seven miles from the U.S. and Mexico border. Chula Vista has an approximate population of over 275,000 and growing with the development of our bayfront, which includes the development of a 535-acre hotel and resort property, convention center, parks, and residential housing.

You may be wondering why a Chief of Police from a mid-size agency in California is talking with you today. Our city has been one of the fastest-growing cities in our nation. As a result, I have had to adjust public safety strategies to meet rapid changes in the needs of our community. We have embraced the use of technology to ensure my department keeps up with the changes in population demographics, traffic density, the location and scale of public safety calls for service, and other factors, all of which result in increased demands from our community at a time when our department is facing hiring challenges that most if not all police departments are experiencing today.

I have been in law enforcement with the Chula Vista Police Department for over 30 years. I have seen innovation and technology go from nonexistent and minimal, to crucial and essential tools for the safety and effectiveness of our officers. When I began my career, technology was limited. We hand wrote our police reports, on paper report forms in pencil in case we made a mistake; there were no mobile data computers, and we would receive limited call information from a dispatcher over the radio. It was up to my partners and I to react and cope with whatever scene that we were thrust into. Sometimes that worked out well; other times, it was challenging to say the least. In police work, we don't have a crystal ball and usually can't see whatever we may be about to face. Without the ability to adequately prepare for what our officers will encounter, our profession leaves so much to chance, which can sometimes result in unpredictable consequences. Let me explain in detail about the Drone as First Responder program, and how it helps give officers real-time information before they arrive at a crime scene so that they can be better prepared to keep themselves and our community safe.

OVERVIEW

In 2018, the Chula Vista Police Department (California) pioneered a new concept in rapid response to police emergencies: Using uncrewed aerial systems (commonly known as drones) to pro-actively respond to emergency calls. The concept was so revolutionary that in May of 2018, it was chosen as the only municipal program in the nation a part of the FAA's Integration Pilot Program (IPP).

The Drone as First Responder concept is different than traditional drone programs in that it is proactive rather than reactive. Instead of launching a drone after an officer is already on scene, Chula Vista's DFR program stations drones at permanent locations throughout the city and respond proactively to emergencies as soon as they happen.

The intent of the program is to get a drone on scene before responding officers arrive. Certified teleoperators can evaluate the situation remotely and relay information to officers and field supervisors. The drone can also feed live-streaming video of the incident to commanders and first responders. This helps personnel determine the best tools, tactics, and resources to safely mitigate a problem—often before officers arrive on scene.

HISTORY OF THE DFR PROGRAM

In December 2015, the Chula Vista Police Department formed a UAS committee and began studying the use of technology in our public safety operations. The Uncrewed Aerial Systems (UAS) committee met dozens of times to explore best practices, policies, and procedures regarding using UAS technology within law enforcement. In 2017, we started tactical operations and deployed drones in the field.

Prior to implementing the UAS Program, Chula Vista Police Department discussed its plan for UAS operations in the media, in public forums, and posted information about the project on the Chula Vista Police Department website. This outreach included a mechanism for the public to contact or email the UAS Team to comment on Chula Vista Police Department's UAS policy, to express concerns, or provide feedback. It is important to note that, out of respect for civil liberties and personal privacy, Chula Vista Police Department's UAS policy specifically prohibits the use of UAS systems for general surveillance. After exhaustive planning and research, Chula Vista Police department activated its UAS Program in the summer of 2017 to support tactical operations by our first responders.

Beginning on October 22, 2018, with strong support from the community, we began deploying drones from the rooftop of the police department headquarters to 911 calls and other reports of emergency incidents, such as crimes in progress, fires,

traffic accidents, and reports of dangerous subjects. This unique Concept of Operations (CONOPS) for drones developed out of a partnership between Chula Vista Police Department and third-party entities. Chula Vista Police Department was a part of the San Diego IPP Team, selected as one of only 10 teams among hundreds of applicants as part of the FAA's Integration Pilot Project (IPP). The IPP was a federal initiative designed to help integrate drones into the National Air Space (NAS).

Chula Vista Police Department's CONOPS is called Drone as First Responder (DFR), and it is a transformational method of policing that has demonstrated the ability to increase officer and community safety and reduce overall police response times. DFR provides the ability to see what is going on at an incident before emergency personnel arrive on scene. In addition to the overhead perspective that traditional air support has always provided, DFR allows a trained incident commander to "virtually" arrive on scene first, sometimes minutes before officers are in harm's way.

The drone has a powerful on-board camera that streams HD video back to the department's real-time operations center where the teleoperator, who is a trained critical incident manager, not only controls the drone remotely, but communicates with the units in the field to give them information and tactical intelligence about what they are responding to. The system also streams the video feed to the cell phones of the first responders, supervisors, and command staff, so they can see exactly what the drone is seeing.

The DFR Program continued to expand its capabilities with the ultimate goal of providing the ability to respond to any location in the city within minutes. In May 2019, the FAA authorized Chula Vista Police Department to fly Beyond Visual Line of Sight (BVLOS waiver). This allowed the drones to fly up to 3 miles in any direction from the launch site (within city limits). Moving from a 1-mile flight radius to 3 miles increased the area of service exponentially.

In August 2019, Chula Vista Police Department partnered with private entities in our city and expanded its operations from one launch site to two launch sites in the city. The addition of the second site allowed the police department to provide DFR coverage over the entire western portion of the city. This area is roughly 30% of the City's geographic area but, due to its density and commercial activity, is responsible for about 70% of the priority calls for service.

In March 2021, we again made history as the first in the United States to obtain Federal Aviation Administration (FAA) authorization to launch from anywhere in the city. In addition, Chula Vista Police Department formed business community partnerships with other third-party entities in strategic locations in the eastern parts of the City to add three more launch sites. With the addition of the three new launch sites, we now have five launch sites available to Chula Vista Police Department, which allows the DFR Program to provide city-wide coverage and can launch drones to much of the geographical area of Chula Vista (see below figure 1).

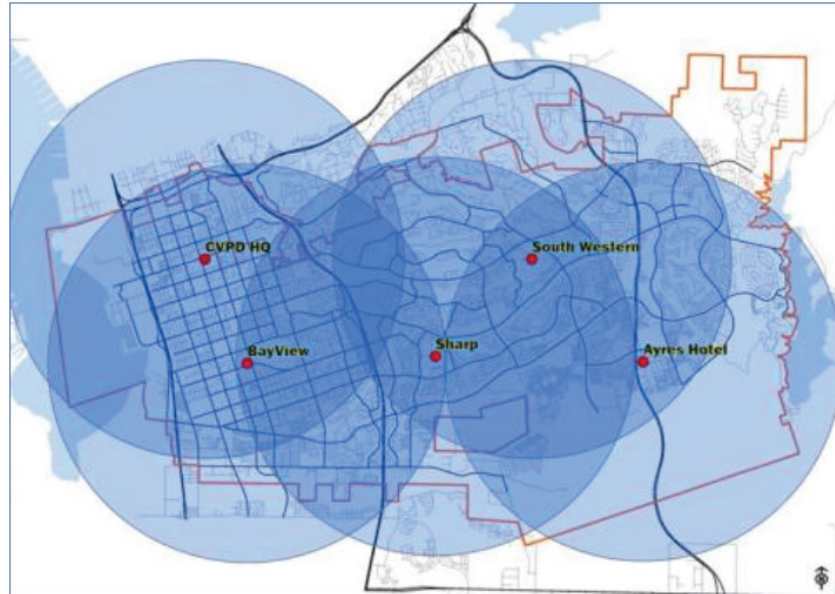


Figure 1. DFR launch locations

Additionally, Chula Vista Police Department was the first in the nation to obtain a two-to-one waiver, allowing us to launch two drones from each location. Flight time is limited for each drone but having the ability to launch two drones from each location gives us uninterrupted coverage when the community needs us most.

DFR PROGRAM STAFFING

The Chula Vista Police Department's DFR program includes two dedicated full-time police officers who are teleoperators for the drones. The teleoperators work from a dedicated office space within the police headquarters building, located near the watch commander's office and the police department's Real Time Operations Center. Additionally, when our DFR program started the FAA regulations required additional personnel to always maintain direct visual observation of the UAS while in flight.

At that time, the FAA prohibited using technology or virtual presence to meet this requirement. As a result, the Police Department must also maintain a physical presence of at least one Pilot-in-Command (PIC) at each launch site to directly view and monitor the airspace around the drone, who can take immediate control of the drone if necessary to avoid an accident. To meet this requirement, the Police Department utilizes a private third-party company to provide staffing to fulfill this FAA requirement for Pilots-in-Command.

CURRENT STATUS OF THE DFR PROGRAM

Since the program's inception, DFR has responded to more than 14,000 calls for service. In a statistically significant number of situations (over 25% of the time, or 3,509 deployments), DFR avoided the need to send ground units to the scene. Most of these calls for service (without DFR support) would have otherwise required a two-officer response. In addition, the DFR program allows the Police Department to have a drone resource on the scene of an emergency much quicker than ground units.

As seen in Figure 2, on average, since the start of our DFR program, a drone arrives on the scene of a call in just under 2 minutes. The drone's rapid arrival allows the teleoperator to relay information to responding officers and helps document crimes-in-progress to enhance subsequent criminal investigations and prosecution.

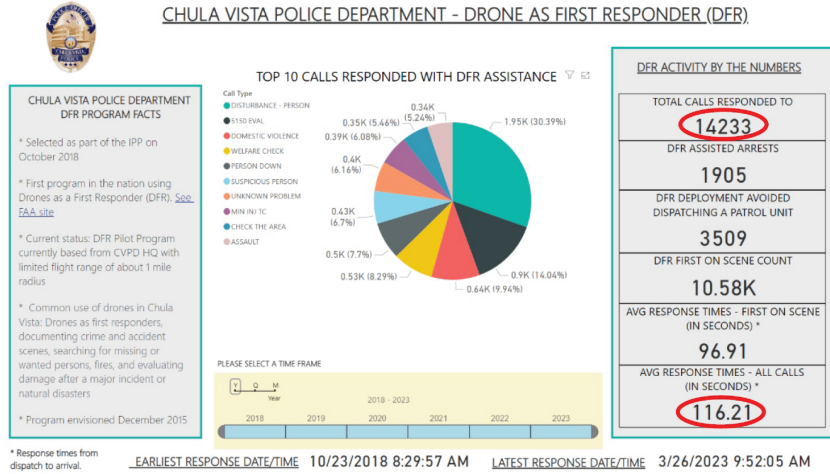


Figure 2. Drone as First Responder Dashboard (October 2018 to March 26, 2023)

TRANSPARENCY

Transparency and building trust with our community is so important to Chula Vista Police Department that we created a dashboard for our community. Often the community mistakes any drone as a law enforcement drone. Beginning in April 2021, Chula Vista Police Department along with third party vendors partnered to provide information on every flight by a Chula Vista Police Department drone.

Chula Vista Police Department uses drone software to track all drone flights launched by the department to achieve public transparency. The drone flight dashboard displays the date, time, incident or case number, and flight path. Chula Vista Police Department's policies prohibit drone operators from intentionally recording or transmitting images of any location where a person would have a reasonable expectation of privacy, except where authorized by a warrant issued by a judge or in emergencies. See figure 3 below.

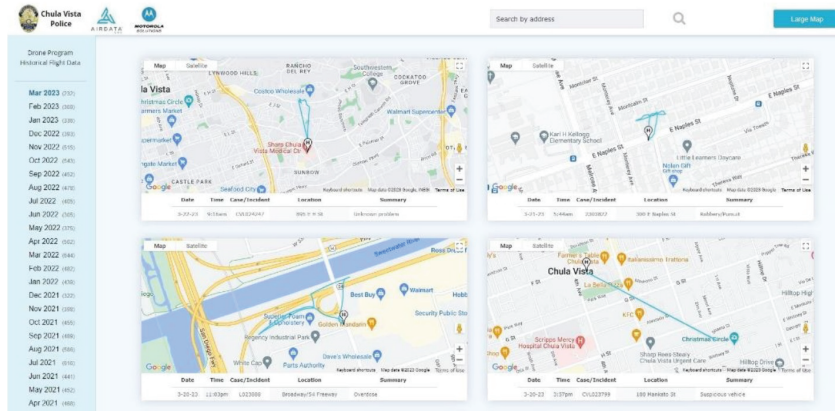


Figure 3. Drone as First Responder Flight Data

PRIVACY

Our community's privacy is of the utmost importance, and the Chula Vista Police Department is committed to maintaining and protecting the privacy rights of our community. One way we ensure our community's privacy is when clearing a call, the camera is automatically pointed to the horizon when returning to the launch

location. The Chula Vista Police Department's use of drones is intended to enhance its response to calls for service. As such, drones are only used during an active response to an emergency or other call for police assistance, and the videos captured constitute investigatory records exempt from disclosure under California's open record laws.

In addition, any video that may not fall under the investigatory category may be shielded from disclosure under various other California state laws, such as the Welfare and Institutions Code and the Vehicle Code. The Chula Vista Police Department prohibits drone operators from intentionally recording or transmitting images of any location where a person would have a reasonable expectation of privacy, such as private backyards or inside private buildings, except where authorized by a warrant issued by a judge or in emergencies.

DATA COLLECTION AND STORAGE

Video and photos collected by DFR are stored to conduct police investigations and subsequent prosecutions. Accordingly, videos and photos are generally accessible to police investigators for official use only. Like all police records, video and photos may also be subject to additional release under the same rules and restrictions as Body Worn Camera (BWC) Video and other items of evidence. Generally, UAS photos and videos are considered part of the investigative record. Therefore, they are unavailable under the California Public Records Act (CPRA) or Freedom of Information Act (FOIA).

I am aware of concerns with foreign drone technology and the potential for access to confidential law enforcement information. Our drone data does not utilize the on-board software from the drone manufacturer. From the onset of our program, we have used an encrypted, U.S.-based software program to bypass the drone manufacturer's systems. Our data is encrypted and stored on U.S.-based servers that meet federal requirements for confidential law enforcement databases.

Additionally, the Chula Vista Police Department owns ALL its data. Chula Vista Police Department does not share or sell any of its data with any 3rd party companies. Third party companies cannot access our data from the Chula Vista Police Department.

The Chula Vista Police Department's use of foreign drone technology is driven solely due to capabilities and equipment of the foreign drone system. This includes flight time and distance and most importantly the optical and digital zoom with the camera. I am hopeful that American made drone companies will be able to manufacture a credible option to their foreign competitors. I feel law enforcement agencies are struggling to keep up with rising crimes rates.

It is my understanding that American made drones that are capable of all the necessary requirements for a DFR program are still many years away of being a proven replacement. Being forced to use a less suitable drone will cripple, if not halt, a successful drone program. Cost factors are also a significant concern for law enforcement agencies.

SUCCESS STORIES

Person with a gun (Figure 4)

Let me give you a few examples of DFR success stories. There was a call for service to a local taco shop in our city. Multiple calls came in from frightened patrons reporting a man sitting at a table waving a gun and acting strangely. His behavior was concerning, and based on the details, we were unsure whether the subject was under the influence or experiencing a mental health crisis.

Our teleoperator launched a drone, arrived on the scene within a minute, and provided invaluable information to responding officers.

As the teleoperator operator watched from above, he noticed the subject moved the gun toward his mouth at one point. The concern was this person might be preparing to commit suicide. Instead, the person placed a cigarette in his mouth while talking and then lit the cigarette with what appeared to be a gun. You could see him now puffing on the cigarette and blowing smoke. In reality, it was a cigarette lighter, not a gun. This information was provided to incoming officers, which helped create a clearer picture in their minds and changed the response of the arriving officers.

A traditional police response to this call could have ended tragically. However, the ability to view the scene before officers arrive saves lives. This is just one of the hundreds of examples of technology and innovation keeping officers and our community safer. Drone as First Responder is the best de-escalation tool, I have seen in my law enforcement career.



Figure 4. Photo depicts a subject with what appears to be a gun but is a cigarette lighter.

Domestic Violence Call (Figure 5)

Another example is when dispatch received a call about a domestic violence incident between a male and a female. Unfortunately, no officers were available to respond at the time, but our teleoperator heard the call and launched the nearest drone. The caller reported that one half of the dispute was on a motorcycle, and the other half was in a car. The caller continued stating the female in the car was trying to run into the male on the motorcycle.

Once overhead, the teleoperator saw a white vehicle driving erratically in reverse, chasing a motorcyclist. The motorcyclist was forced to ride on the sidewalk to avoid being run over by the car. The teleoperator immediately recognized the severity of the call and asked Dispatch to clear officers from other calls to respond to this evolving emergency.

During the call, the white vehicle is seen trying to ram the motorcyclist multiple times, even hitting the motorcyclist while he is stopped. The video is dramatic, and as it escalated, the motorcyclist was captured on video driving down an alley; trying to get away from the pursuing car.

The teleoperator was able to monitor the incident and direct officers to the scene. Once officers arrived and through their initial investigation, the vehicle driver was arrested for domestic violence. The motorcyclist was also arrested; the motorcycle he was driving was reported stolen.



Figure 5. Photo depicts a driver trying to run motorcyclists over.

Person with a gun (Figure 6)

An additional example is our dispatch center received a call of a person with a gun at our marina area. This area in our city is very popular and at times can be filled with hundreds of pedestrians and vehicles. Dispatch began receiving multiple calls of a person with a gun at the marina. The only other information received was that the person was in a red vehicle.

Our teleoperator heard the call and launched the drone. Once the teleoperator arrived on scene, there were multiple cars at the marina but was lucky there was only one red car. As the teleoperator zoomed in with the camera it showed a female holding a weapon and pointing it towards the water. The female could be seen manipulating the weapon. The teleoperator directed ground units to the female and her companions. They learned the weapon was just a BB gun.

Without the technology of DFR, this situation could have ended tragically.



Figure 6. Photo depicts person handling what appears to be a firearm.

Missing Juvenile at Risk (No photo)

My last example is regarding a missing at-risk juvenile. One summer afternoon, dispatch received a call from a mother frantic, reporting her son was missing. The mother explained that her elementary school-aged child had run away. She continued stating that her son became upset, got out of the car, and ran in the opposite direction. The mother quickly lost sight of her son and immediately called the police, panicked, and worried about her son's whereabouts.

Our teleoperator launched the closest drone to check the area for the at-risk juvenile. Within minutes, our drone operator located a young child running in and out of traffic, who seemed lost or disoriented. The child matched the physical description given by his mother, which was relayed to officers in the area also looking for the child.

The teleoperator directed grounds units to the child's location. The officers were able to reunite the child with his mother. The child was found several blocks from where he initially ran from his mother. This call could have ended very differently without the use of our Drone as First Responder program.

RECOMMENDATIONS

Our staff has had to learn FAA regulations, navigate the COA process, work through technology issues, and fight tooth and nail at times to keep our program going with no funding. However, the FAA's support and guidance have been integral to our success. And while our relationship with the FAA Team has been amazing, there are some things they can do better to assist law enforcement agencies in implementing a DFR program such as ours.

1. *FAA'S COA Application Processing System (CAPS) Webpage*

- The website is cumbersome and difficult to navigate. It is not user friendly.
- Additionally, the FAA requires a single user be registered to enter the monthly required COA flight data in the CAPS system. Only one user is allowed to enter information for any government agency changes. The website should allow multiple users per organization this is to prevent any single point of failure and allow an alternate or backup user to complete requirements.

2. *Law Enforcement Assistance Program (LEAP) Agent Assistance*

- LEAP Special Agents should be more available to agencies looking to apply for or renew COAs and waivers. There are over 18,000 law enforcement

agencies in the United States and very few LEAP agents which makes it challenging to locate and contact the LEAP agent for assistance.

3. *New Technology Progression*

- FAA should continue to support law enforcements use of drone technology. Recently the FAA authorized a completely BVLOS authorization for another law enforcement agency's DFR operation. This is huge step and a win for law enforcement agencies using drones.

However, The FAA's inconsistencies when it comes to COA and Waiver approvals create confusion. We recommend the recent approval of what some call the "digital visual observer", become a standard option for COA's. Removing the Remote Pilot in Command requirement will reduce staffing costs allowing more law enforcement agencies the ability to have a DFR program such as ours.

CONCLUSION

In closing, the last few years have been challenging for law enforcement. Recruitment, hiring and retention are now at an all-time low. Law enforcement needs technology to help us meet the needs of the American people. Although, drones are not a replacement for first responders they are an important enhancement for modern policing.

For the last five years, Chula Vista Police Department has blazed a path that I never imagined was possible when I was appointed chief six and a half years ago. Our success is a pleasant surprise after a lot of hard work, sacrifice, and trial and error.

We know the work we are doing is laying the foundation for the FAA to help other agencies and drone programs throughout the country and we are doing our best to help others realize the benefits of drones for good.

This endeavor has forged a pathway for other public safety agencies to follow our lead to establish their own innovative programs appropriate to their communities and airspace.

The Drone as First Responder program is de-escalation at its best. By using drones, we provide officers, dispatchers, and supervisors with invaluable information. This allows officers to view potential hazards and develop sound strategies and tactics before rushing into potentially dangerous situations. The use of drones by law enforcement is one of the best tools for protecting our communities and harnessing the innovation of flight to deliver for the American people.

Mr. COLLINS. Thank you.

Dr. Stuart Ginn, you are recognized for 5 minutes for your testimony.

TESTIMONY OF STUART GINN, M.D., MEDICAL DIRECTOR, WAKEMED INNOVATIONS, WAKEMED HEALTH AND HOSPITALS

Dr. GINN. Thank you.

Mr. Chairman, Ranking Member Cohen, distinguished members of the Aviation Subcommittee, thank you for this opportunity to testify today.

My name is Stuart Ginn. I am an ENT physician and surgeon at WakeMed Health and Hospitals in Raleigh, North Carolina, where I also serve as the medical director of innovations. I am also the cofounder and president of the Coalition for Advanced Health Mobility, and a lifelong aviator and former flight instructor and airline pilot.

WakeMed helped to develop the first drone-based medical package delivery system through our participation in the Integration Pilot Program. What we have seen in advanced health mobility makes it clear that uncrewed aircraft systems can improve healthcare access, save lives, and bring new efficiencies to healthcare logistics.

I will outline three example use cases demonstrating how UAS can position to enhance public health.

First, the creation of UAS routes connecting medical centers and blood banks, enabling the expeditious transport of blood products to support trauma in critical care systems. Research has shown that UAS can reduce delivery times by 50 percent, mitigating blood supply and distribution issues and potentially improving outcomes for critically injured or ill patients.

Second, UAS could become a frontline tool for emergency response within communities. An obvious example is the delivery of automated external defibrillators, or AEDs, to patients suffering sudden cardiac arrest. Every minute that passes before defibrillation results in a 7- to 10-percent reduction in survival, and AEDs are often inaccessible in communities. Similar time-critical deliveries could include epinephrine, naloxone, or albuterol rescue inhalers.

Third, UAS can deliver medications and devices to support remote and virtual healthcare services. Access to reliable transportation to retrieve prescriptions or receive in-person medical care is often limited in both rural and urban communities, resulting in patients not receiving needed care.

WakeMed was privileged to participate in the FAA's Integration Pilot Program and the current BEYOND program in partnership with the North Carolina Department of Transportation's team. Our initial UAS operation focused on the routine delivery of test samples from an outpatient facility to WakeMed's main campus laboratory. The UAS program augmented the ground courier network and provided more efficient delivery of lab specimens.

While the program demonstrated the technology's utility, WakeMed made the decision to pause UAS operations due to the limited scalability afforded under the current regulatory regime. Specific regulatory limitations included the types of payloads that could be delivered, route expansion capabilities, flying beyond visual line-of-sight, or BVLOS, flying over people, and highly automated operations.

WakeMed remains committed to advanced mobility. However, like other healthcare systems, we have been unable to continue investment until the regulatory environment evolves to meet the opportunity.

For UAS operations that provide public health benefits, we should consider risk more holistically, including not only the risk to aircraft and people on the ground but also the risk of not conducting an operation—a concept referred to as “dynamic risk.”

Dynamic risk has been well-studied as a framework for adoption by several leading entities and may be best understood through the AED delivery use case. We have a technological capability to deliver an AED to a patient in cardiac arrest so that a bystander can begin defibrillation, for instance. In communities where first responders may take up to 15 minutes to arrive, the UAS may arrive up to 8 minutes faster. This potentially results in an 80-percent improvement in survival.

The relative value of conducting this type of operation is self-evident. However, under current regulations, it is not possible.

It is important to note that the dynamic risk model does not suggest a reduction or decreased emphasis on aviation safety. What I am suggesting is updating the processes being adopted from traditional aviation to better align with the opportunities and benefits UAS provide.

In addition, we need to understand that the UAS industry is at an inflection point. Innovative companies in this space are operating with little to no revenue or profit, awaiting development of a regulatory framework that can support UAS integration and operations at scale. These innovators require a mature regulatory framework to offer products and services to healthcare customers with more palatable economics.

I provide the Aviation Subcommittee with two recommendations for consideration as part of the 2023 FAA reauthorization: One, instruct the FAA to recognize and incorporate the concept of dynamic risk in approving operational requests that provide a clear public benefit; and, two, include a funded pilot program that will enable further testing, evaluation, and deployment of BVLOS and highly automated UAS operations in industries that provide a clear public benefit.

Thank you for the opportunity to testify, and I look forward to answering any specific questions from the subcommittee.

[Dr. Ginn's prepared statement follows:]

Prepared Statement of Stuart Ginn, M.D., Medical Director, WakeMed Innovations, WakeMed Health and Hospitals

Chairman Graves, Ranking Member Cohen, distinguished Members of the Aviation Subcommittee, thank you for this opportunity to testify before you today to share my perspective on priorities associated with the upcoming FAA Reauthorization.

My name is Dr. Stuart Ginn, I am an ear, nose and throat (ENT) physician and surgeon at WakeMed Health and Hospitals in Raleigh, North Carolina, where I also serve as the hospital's Medical Director of Innovations. WakeMed is a private, not-for-profit healthcare system with three hospitals totaling 970 beds, including Wake County's only Level I Trauma Center, and several free-standing full-service Emergency Departments distributed across our community. WakeMed serves as the safety net hospital system serving one of the fastest-growing metropolitan areas in the United States and employs nearly 12,000 community members in our region. WakeMed is committed to improving the health and well-being of our community by providing outstanding and compassionate care to all and works to remain a leader in patient safety, innovation, and education.

Prior to working in healthcare for the past two decades, I began my career in aviation. At just 14 years old, I started learning to fly, earning my private pilot certificate and eventually becoming a certified flight instructor (CFI). Ultimately, I received my commercial pilot certification and subsequently served as a First Officer at a United Express carrier.

In my role as Medical Director of Innovations, I have had the privilege, over the past several years, to leverage both passions to bring advanced aviation technology to our health system in an effort to prove uncrewed aircraft systems (UAS) can be utilized to improve overall quality and access to healthcare. Our efforts, working with the North Carolina Department of Transportation (NCDOT) and all of our industry partners as part of the FAA's Integration Pilot Program (IPP) and BEYOND Programs, have been an incredible experience and we have learned a great deal.

I was so inspired by our efforts in North Carolina that I wanted to make sure that hospitals and health systems across the country were aware of these opportunities and had the basic tools necessary to get air operations up and running. So, in 2021, I co-founded the Coalition for Advanced Health Mobility (CAHM), where I currently serve as President.

What we've seen in advanced health mobility makes it clear that this technology can revolutionize healthcare access, save countless lives in emergency response situations, and bring health logistics to new levels of efficiency. However, we have also faced substantial barriers to implementation in our efforts to integrate and scale the technology to better serve our community. Over the next several minutes I would like to share my thoughts on how we can seize this opportunity and work collaboratively to find innovative solutions to break through the chokepoints keeping us from reaching full capability in this area.

OPPORTUNITY FOR UAS IN HEALTHCARE

UAS technology presents an incredible opportunity for both the aviation and healthcare industries. As an aviator, I can appreciate all the benefits that UAS bring, including lowering barriers to access, aviation-related jobs, and utilizing a greater percentage of the National Airspace System (NAS). As a healthcare professional, UAS present an opportunity to provide low cost, rapid response capabilities to deliver high-value medical payloads between facilities and directly to those in need, extending the reach of healthcare facilities and providers and delivering new forms of flexible healthcare infrastructure. The result is the ability to address critical public health needs using traditionally underutilized airspace while improving opportunities for access to aviation and achieving a high level of operational safety.

I've prepared three sample use cases which I believe represent relevant examples of how UAS are positioned to enhance public health.

Blood Product and Sample Delivery: A critical and feasible early use case is the creation of UAS routes connecting medical centers and enabling the expeditious transport of blood products to support trauma and critical care systems. Research has shown UAS can reduce blood product delivery times by 50%, improving outcomes for critically injured or ill patients.¹ Blood and laboratory samples, vaccines, testing kits, and other supplies can also be transported between facilities, greatly improving access to these supplies and devices and improving patient care. This is consistent with WakeMed's program findings when delivering blood samples across the WakeMed Raleigh Campus, reducing delivery times from 44 minutes per delivery on average to 20 minutes.

Emergency Response Delivery: Emergency medical services (EMS) continue to see rapid advancement in technologies, best practices, and potentially lifesaving tools that often take far too long to implement. UAS could become a front-line tool for emergency response systems. One of the most obvious examples is the delivery of automated external defibrillators (AEDs), which are compact, portable devices capable of delivering an electric shock to a patient in cardiac arrest. Patients who experience sudden cardiac arrest, who may have no prior medical history of heart disease, have a 5% survival rate in the United States.² According to the same study published by the American Heart Association, data shows survival rates from cardiac arrest double when bystanders apply an AED before emergency responders can arrive. Every minute that passes while a patient waits for defibrillation results in a 7% to 10% reduction in survival.³ This presents a significant opportunity for UAS to be deployed for rapid delivery of AEDs to patients in the community where distance from a healthcare facility or personnel would otherwise impact their survival. There are many areas across the country where UAS delivery could dramatically reduce response times compared to traditional EMS due to terrain, population density, or traffic congestion. Other examples of emergency response applications include delivering epinephrine (EpiPen) for severe allergic reactions, Naloxone (Narcan) for treatment of overdoses, albuterol rescue inhalers for respiratory distress, and glucose or dextrose for severe hypoglycemia, all potentially fatal conditions without immediate medical intervention.

Prescription and Medical Device Delivery: UAS may provide patients with the option to have their prescriptions or other healthcare devices to support virtual care services delivered via air transport. Access to reliable transportation to pick up prescriptions or receive in-person medical care may not always be an option, resulting in patients not receiving needed care. Remote health is also evolving rapidly in the wake of the pandemic, resulting in healthcare systems across the country prioritizing innovation in remote healthcare and expanding how health services are delivered. There are devices a patient can use at home that provide a virtual healthcare physician with important data needed for patient diagnosis and treat-

¹(Li, et al. 2022)

²(Pollack, et al. 2018)

³(Cheskes, et al. 2020)

ment. These devices could be delivered from a healthcare facility directly to a patient to support virtual care services.

While I focus this presentation on small UAS, there are ample use cases for crewed and uncrewed advanced air mobility (AAM) aircraft, as well. These would include emergency response, the transport of doctors and patients between facilities, and supporting larger medical cargo deliveries between centers and across larger regions. Please take this small subset of use cases as a glimpse of the potential for UAS to provide public health benefits, and note there are many use cases not discussed, such as organ transfer and natural disaster response, to name a few.

PROGRESS IN UAS MEDICAL PACKAGE DELIVERY

The FAA's UAS Integration Pilot Program (IPP) was established in 2017 as the result of a presidential memorandum to enable enhanced drone integration into the NAS.⁴ The program evaluated several use cases across diverse environments to collect data to inform regulatory changes necessary to facilitate safe, scalable, and repeatable operations, while also providing valuable data on the societal and economic implications of wide-scale implementation.

WakeMed joined the NCDOT IPP Lead Participant team because of the potential for UAS to support system growth, expand our geographic service footprint, address longstanding logistics challenges impeding care delivery, increase transparency in the supply chain, and work towards effective UAS integration into routine healthcare system operations. Other North Carolina healthcare systems delivered personal protective equipment (PPE), transfusion materials, pharmaceuticals, and vaccinations. NCDOT team partners completed about 12,000 medical package deliveries under the FAA IPP and have completed about 6,000 thus far under the FAA BEYOND Program.⁵

WakeMed's initial operation with UAS manufacturer Matternet and UAS operator UPS Flight Forward focused on the routine delivery of test samples from an outpatient surgical center and clinic to WakeMed's main campus laboratory. The UAS delivery augmented ground courier deliveries on the route and provided for faster, more efficient delivery of lab samples between those facilities. To enable this operation, UPS Flight Forward was required to obtain FAA approval to carry hazardous materials (HAZMAT) and local airspace coordination with medical helicopter operations was required. UPS Flight Forward went on to achieve the first Uncrewed Standard Part 135 Air Carrier certification from the FAA in 2019 and Matternet developed one of the first FAA type-certified UAS in the United States.⁶

Ultimately, WakeMed and our partners in the IPP completed 1,663 safe flights, serving 6,648 patients in need, and drastically cutting the average medical delivery time from an hour to only a few minutes, enabling patients to both rapidly receive a diagnosis and begin treatment.⁷

In August of 2021, WakeMed reassessed the cost-benefit of our UAS program to determine whether the program's demands and benefits aligned with the costs of competing priorities. The challenging decision was made to pause the UAS program on the basis that its limited scale did not support feasible economics or capabilities for the overall delivery system. This appears to be an emerging theme among other healthcare systems engaged in UAS innovation. While WakeMed remains a partner for the NCDOT BEYOND program, we, along with other healthcare systems, are unable to continue to financially invest in a technology that faces continued regulatory constraints towards commercialization and scalability.

Other healthcare systems across the country have also initiated pilot programs or demonstrations to investigate how UAS can improve healthcare services. In April 2019, the first organ was flown 2.8 miles from an organ procurement non-profit on the outskirts of Baltimore to the University of Maryland Medical Center in the city's urban core.⁸ This delivery occurred outside of the IPP program but signaled to medical professionals and advocates in healthcare that we were on the precipice of substantial advancement in the industry. In January 2021, the State University of New York's (SUNY) Upstate University Hospital began UAS transport of COVID-19 testing kits from the downtown Syracuse hospital to nearby laboratories.⁹ Other healthcare systems invested in UAS medical package delivery include University of

⁴(Trump 2017)

⁵(Block 2023)

⁶(AUVSI News 2019); (Federal Aviation Administration 2022)

⁷(See Footnote 5)

⁸(Maryland Today Staff 2019)

⁹(Geddes 2021)

California San Diego Health, Novant Health, Vidant Health, Atrium Health, Beaumont Health, Cardinal Health, Hutchinson Regional Health System, and others.

CHALLENGES TO UAS MEDICAL PACKAGE DELIVERY

The largest impediment to healthcare systems deploying and sustaining UAS medical package delivery programs are the current regulatory constraints. Let me start by saying I think the FAA has worked under challenging circumstances to adapt regulations that have proven to be effective at maintaining U.S. leadership and safety in traditional crewed aviation. However, adapting and applying these regulations has been burdensome relative to the risk of the proposed operations. WakeMed would still be flying, potentially on a larger scale, if not for the immense regulatory constraints that ultimately made it too difficult to continue investment in the program.

For healthcare systems to adopt UAS technology, the operations need to be scalable with reasonable economics to support the financial investments in standing up and integrating a UAS program. WakeMed learned this firsthand as program growth was significantly constrained by regulatory approval processes which were out of our control. Some examples of these pain points include: limitations on what types of payloads could be delivered with UAS, limited route expansion capabilities, restrictions on flying beyond visual line of sight (BVLOS), restrictions on flying over people and vehicles, and any significant level of automation. A healthcare system is highly incentivized by UAS operations that can quickly scale, adapt to new payloads as needs arise, and deliver across a larger geographic region in both rural and urban settings.

As an example, WakeMed attempted to implement a new use case at the beginning of the pandemic leveraging our existing UAS system to support an expanded COVID testing network. Our operator petitioned the FAA for operational approval with supporting documentation to deploy UAS for a distributed testing model to improve access to early COVID testing where it was desperately needed. The idea had broad support from within WakeMed and presented an opportunity to build on the successful deployment of UAS for lab specimen transport to uniquely support public health in our region. Ultimately, the request was not approved and the public health benefits we were trying to achieve could not be realized.

The constraints of scaling operations due to regulatory barriers have also limited healthcare investments in important infrastructure to sustain operations and improve operational efficiencies. These include investing in infrastructure integration, both physical and digital, developing multimodal transportation systems interfaces, integrating into the healthcare operation, and more. The pilot programs to-date have never truly relied on UAS to deliver medical packages; they have always been ancillary, with other transportation alternatives as the primary modes.

I am aware of several other healthcare systems who have also had to slow or pause UAS operations due to lack of regulatory progress to approve UAS operations. WakeMed is not an anomaly, this is happening across the United States as pilot programs struggle to transition into sustained operations. The technology is ready. The regulatory foundation is not.

WHAT IS NEEDED TO ENABLE PUBLIC HEALTH BENEFITS

The FAA has taken the approach of defining acceptable levels of risk for commercial and general aviation that considers air and ground risks in safety case analyses. The standards developed for crewed aviation have set a high bar for safety, which makes sense because an incident in the air is catastrophic to those directly impacted onboard and potentially non-participating individuals on the ground. The FAA has applied the same safety methodology and processes to UAS, targeting equivalent levels of safety for small uncrewed aircraft operating in the NAS. I believe the FAA's approach has been the most conservative, especially for existing airspace users to prevent mid-air collisions, but is a static approach for evaluating risk for UAS operations.

For operations that provide public health benefits, we should consider risk more holistically to include not only the risk to aircraft and people on the ground, but also the *risk of not conducting an operation*. This concept is referred to as dynamic risk where the risk of performing an operation is evaluated against the benefits that operation provides.

Dynamic risk has been well studied as a framework for adoption by several leading entities including NASA, the National Institutes of Health (NIH), and the American Institute of Aeronautics and Astronautics (AIAA). The FAA found in their IPP Final Report that identifying potential societal and economic impacts is important for safely integrating UAS package deliveries and recommended the FAA measure

and quantify the societal and economic impacts of UAS operations. The FAA UAS Beyond Visual Line of Sight (BVLOS) Aviation Rulemaking Committee (ARC) Final Report recommended the FAA assess and evaluate the societal benefits and consider those benefits as part of the “overall risk and rewards balance”. Additionally, MITRE, a Federally Funded R&D Center (FFRDC), released “A Holistic Approach for Assessing Drone Benefits, Safety, and Societal Acceptance” which outlines an approach for considering the potential risks and benefits of a proposed UAS operation as part of a broader NAS risk assessment.

Dynamic risk may be best understood through the AED delivery use case presented earlier. The risk of mortality after suffering from sudden cardiac arrest increases by 7% to 10% for every minute of delay before defibrillation.¹⁰ A UAS could be launched, fly beyond visual line of sight, and drop an AED to nearby bystander to begin defibrillation all within minutes in a rural community, which may have otherwise taken up to 15 minutes for first responders to arrive. The previously mentioned study shows that UAS may arrive between 1.8 to 8 minutes faster compared to traditional medic units, resulting in a 12.6% to 80% improvement in the chance of survival. In this case, where every second matters, saving just a few minutes provides substantial public health benefits by improving the chance of an individual surviving following a cardiac arrest. Few would question the necessity of conducting this type of operation when the choice is between either increasing an individual’s chance of survival by 80% versus the potential air and ground risk of flying a UAS the in the NAS at an altitude at or below 400 feet in a rural environment.

It is important to note the dynamic risk model does not suggest a reduction or decreased emphasis in aviation safety. No aircraft should fly beyond visual line of sight if it has not been designed to do so or if it does not have reasonable safety mitigations in place. What I am suggesting is to update the antiquated processes being adapted from traditional aviation to better align with the opportunities UAS may provide to benefit society and healthcare systems like WakeMed.

In addition, we need to understand the UAS industry is at an inflection point. Companies have been working tirelessly since before the FAA IPP kicked off in 2017, operating for years with little to no revenue or profit while awaiting development of a regulatory framework to enable UAS integration and scalability. Investment in use cases that support critical societal needs will enable further testing and data collection for advanced and complex UAS operations. The public has a higher tolerance for risk for use cases with clear public benefit. As such, public health applications should continue to be an early focal point for FAA programs especially for advanced UAS operations, such as BVLOS and highly automated operations. Safety data and best practices achieved in these high-value operations can then be utilized to enable further industry maturation.

SUMMARY AND RECOMMENDATIONS

Healthcare systems have demonstrated a desire to integrate UAS into their day-to-day operations and to leverage the technology to deliver innovative services within their communities, creating substantial public health benefits. These benefits include increasing access to healthcare services, delivering lifesaving medicines and equipment within communities, and improving the economics of delivering healthcare, to name a few. Healthcare systems like WakeMed are ready to leverage the positive momentum from the IPP and BEYOND programs to develop scalable, flexible, UAS-based systems to augment healthcare infrastructure and enhance public health. Unfortunately, the current regulatory framework has inhibited innovation in the healthcare domain as lead times for regulatory approvals and operational economics have made it difficult to sustain investment in UAS programs. These challenges have also limited healthcare investment in internal infrastructure and integration that would enable broader adoption within the healthcare system.

I provide the Aviation Subcommittee two recommendations for consideration as part of the 2023 FAA Reauthorization:

1. *Include language in the FAA Reauthorization to recognize and utilize the concept of dynamic risk in approving operational requests that provide a clear public benefit.* Dynamic risk will leverage what has worked well for traditional aviation and right-size risk considerations against public benefit for public health and other operations that provide societal benefits.
2. *Include a funded pilot program in the FAA Reauthorization that will enable further testing, evaluation, and deployment of BVLOS and highly automated UAS operations in industries that provide clear public benefits.* The implementation of a dynamic risk model will require further testing and evaluation of

¹⁰(See Footnote 3)

UAS in real-world environments, in parallel to developing the necessary risk models.

Thank you for the opportunity to testify and I look forward to answering any specific questions from the Subcommittee.

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Mr. COLLINS. Thank you.

The chair has been notified there will be a series of votes occurring on the House floor. The committee shall stand in recess, subject to the call of the chair.

[Recess.] [12:12 p.m.]

Mr. YAKYM [presiding]. The Subcommittee on Aviation of the Committee on Transportation and Infrastructure will reconvene the previously recessed hearing.

And before I yield myself time to ask questions, we do have a question from the committee here directed to Mr. Woodworth.

I am going to yield you 1 minute to explain what exactly you have here in the room with us.

Mr. WOODWORTH. Thank you, Chairman.

I am an airplane designer, and so, the comment about being a Spruce Goose I took to heart.

So, this is our airplane. This is the one that we—this isn't a model of it; this is an actual plane that we use to do package delivery around the world today. So, it is about 10 pounds, carries about 3 pounds of stuff, and it goes and delivers boxes.

Mr. COHEN. Is that the real deal?

Mr. WOODWORTH. Yes, sir, that is a real airplane.

Mr. COHEN. Not quite the Spruce Goose?

Mr. WOODWORTH. Sorry, I couldn't hear you, sir.

Ms. COHEN. Not quite the Spruce Goose.

Mr. WOODWORTH. Not quite.

Mr. YAKYM. Thank you, Adam.

I now recognize myself for 5 minutes for questions.

I would like to thank each of our witnesses today for taking time to study your respective fields and lend your expertise as we continue to work on the FAA reauthorization.

For the last 120 years, the United States has been the leader and the elite innovator in aviation since its very inception, but I am concerned that we are starting to cede that ground to foreign nations.

Mr. Woodworth, I want to dig into something in your written testimony that really caught my eye. You state that Wing's most mature and high-volume operations are in Canberra and Logan City, Australia.

Is this indicative of the United States ceding that leadership role? And what is Australia doing that the United States isn't doing that caused those two cities to become your leading markets?

Mr. WOODWORTH. Thank you for the question.

And, yes, in very broad strokes, I think that it comes down to what I mentioned in my testimony about being predictable and pragmatic.

So, there are, what we call in aviation, performance-based standards and outcomes-based rulemakings. So, this is basically like you sort of fit the rules to the size and the risk of the thing that you are talking about.

Australia was one of the first nations and their aviation authority, their CASA, was one of the first organizations to adopt those sorts of standards and rulemaking, and so, we found it as a place where we could go and operate in the way that would be representative—

Mr. YAKYM [interrupting]. Mr. Woodworth, do you mind pulling your mic a little bit closer? I am told that it is not coming through the video.

Mr. WOODWORTH. Sorry about that.

Mr. YAKYM. There you go.

Mr. WOODWORTH. So, Australia and their aviation regulator, CASA, was one of the first aviation regulators in the world to adopt those sorts of performance-based standards and rulemaking. And that presented a framework where we could go and do commercial delivery of packages beyond visual line-of-sight for compensation. And that was really a first-in-the-world type of opportunity.

Interestingly, the idea for this came from the United States. So, the idea around performance-based rulemaking, the idea around these sorts of standards creation is an idea created in the U.S. It

is just that the U.S. has fallen behind in the implementation of it. So, that is why we fly mostly in Australia today.

Mr. YAKYM. Thank you. That is helpful.

And also to Mr. Woodworth, I look at the FAA reauthorization landscape, and I see a lot of proposals that fall underneath the FAA reorganization. But whether it is moving around responsibilities or creating new offices and elevating certain technologies, we have to balance the merits of each of these proposals against the fiscal state of the Nation, also against the prospect of making the FAA even more unwieldy than it is today.

And so, I am working on legislation that would create a new Office of the Associate Administrator for UAS Integration, because I think that drones like yours shouldn't necessarily be treated like someone like Cessna or Boeing as it relates to authorizing that aircraft to fly domestically. We need to acknowledge their unique attributes as well as their unique challenges. And we should give them visibility within the FAA so they don't fall by the wayside, as it seems like is happening right now.

But, Mr. Woodworth, you are on the ground doing this stuff, so, my question for you would be: Would creating an Associate Administrator position at the FAA help Wing and others in your industry?

Mr. WOODWORTH. Yes, we believe it would.

So, the UAS Integration Office has been around for a while now. They are who most of us, as stakeholders, coordinate through almost on a daily basis for advancing the integration of UAS. And they do a lot of the work, they do a lot of coordination, but they do not have decisionmaking, rulemaking, or approval authority.

And so, I think that by elevating the position of that office, creating a new position with it that has the ability to really make decisions and implement approvals, it would take the folks who are doing a lot of the work and give them the authority to follow through with it.

Mr. YAKYM. Great.

And if you could have the level of predictability that you are looking for within the FAA reauthorization, are there additional investments that you would make into research and development and developing additional technologies once you fully deploy this one domestically?

Mr. WOODWORTH. Absolutely.

So, we view ourselves as a delivery company that happens to use airplanes to do that delivery. And as an airplane designer, like, you are not going to use this same airplane to go and deliver every box in the U.S.

So, you are going to need different kinds of airplanes, you are going to need different CONOPS, you are going to need all sorts of different use cases to meet the needs of your constituents. And so, I believe that it is fundamental to have a framework that can adopt that.

Mr. YAKYM. Great.

And, also, speaking of my constituents, I want to recognize five of my constituents who are here today, two from Goshen and three from New Carlisle. I thank you all for coming.

And I yield back.

And now I would like to recognize the ranking member, Mr. Cohen, for 5 minutes of his questions.

Mr. COHEN. Thank you, sir.

Mr. Woodworth, first of all, can you concisely tell us what you think we should pass to have the public understand their interactions with drones and different types of new flight vehicles?

Mr. WOODWORTH. I think it comes back to the recommendations I put forth, and the first two are the keys in that.

So, one, establish a target level of safety. So, say what the bar that we are building to is. And then, two, establish a certification framework that is right-sized to that.

Mr. COHEN. Do you think there will be people that will complain about privacy issues, with these vehicles flying over maybe their swimming pools?

Mr. WOODWORTH. So, that is a question we often get, and I appreciate it. And I think that there is a path forward for the responsible integration of these systems into national airspace and into everyone's daily lives. We take privacy very seriously in our operations, and I know a lot of the other operators here have expressed similar thoughts.

As you said, holding up the cell phone, with any new technology, there are going to be questions about how it is used, how it develops. And I think that bringing it back to building a framework where the Government has the ability and authority to both introduce and regulate those consequences, I think, would provide mitigations.

Mr. COHEN. Thank you.

Dr. Cahill, let me ask you a couple of things.

First of all, you mentioned BEYOND in your testimony. Do you know if that is an acronym?

Ms. CAHILL. Initially, it was not an acronym. They named the program "Beyond," and someone said, "Well, it has to be an acronym," so, they came up with one. And none of us can remember it.

Mr. COHEN. That is appropriate.

Did you recognize Mr. Young here? [Indicating portrait of the late Congressman Don Young.]

Ms. CAHILL. I am delighted to see the painting of Congressman Young here. It reminds me of where I could be, which right now happens to be a lot colder and does not have cherry blossoms.

Mr. COHEN. He was a beloved member of this committee and this Congress, and bipartisan and just—Mr. Young. And I love the fact he has got all forms of transportation in there, except these new ones, the AAM and the UA-whatever, but they were beyond him. Thank you.

What do you see in Alaska? Alaska has so many areas you can't get to except by airplane. How do you see drones and these other vehicles helping Alaska? And do you see them replacing helicopters? Are any of these vehicles that are manned replacing helicopters as vehicles to take people up to see the glaciers?

Ms. CAHILL. Ranking Member Cohen, I do. I see them supplementing in certain cases and replacing in others.

At the moment, we are flying our pipelines, like the Trans-Alaska Pipeline, using helicopters on a regular basis to look for en-

croachment, look for leaks, et cetera. That is a very hazardous mission. If I remember correctly, there have been no fatalities but there have been injuries doing that mission. If we can do that routinely with a drone, with the right instrumentation, we can get excellent data and remove that hazard.

In cases of doing passenger transport and cargo delivery to the communities, this is something where there is going to be a perpetual need to get cargo to those communities that right now are not served by road. Eighty-two percent of our communities are only accessible year-round by air.

So, being able to bring in drones on a regular basis to supplement what is required to be maintained in terms of the balance between passenger and cargo aircraft through the Essential Air Service program is going to be a case where the drones can supplement this but we can't necessarily completely and totally replace it.

Mr. COHEN. And how about with visiting the glaciers, which is a nice thing to do? I had the opportunity to do it in a helicopter. Do you think these smaller vehicles would be able to do that, or are the winds too much of a risk?

Ms. CAHILL. I think in the distance, in the future, once we have proven the reliability of the autonomous systems or the remotely piloted systems, the urban air mobility concept, we would be able to use them for visiting glaciers.

Of course, we need to be very, very careful about the conditions we are flying in.

Mr. COHEN. Right.

Ms. CAHILL. You don't want to be flying in icing conditions. You need to be careful about, you know, if you happen to be really cold on the glacier. There are strong winds, katabatic winds, that come off the glacier.

So, there are a series of things that we would want to make sure that we had tested and evaluated first to ensure that aviation safety.

Mr. COHEN. Thank you.

Dr. Ginn and anybody on the panel that can offer me something: When we have these vehicles up there in the sky, that could be an impediment to commercial aviation that we have today.

What safety procedures, regulations, laws, do you think we need to pass to protect around airports? I know I have seen in Los Angeles sometimes there is a drone flying around the airport and all of that. What do we need to do about that?

Dr. GINN. Well, thank you for the question, Congressman.

I will start by saying that I am here in a capacity as a physician. I don't consider myself an aviation expert. However, I can say from experience, based on the operations that we conducted at my healthcare system, where we actually had to deconflict drones from EMS helicopters in real operating airspace on the ground at our healthcare system, we had to do that process manually, meaning there was not a platform for us to use.

Air traffic control services were not available to us for the—or our operator, I should say, for the drone. So, that process was carried out manually. Phone calls. Our operator had to call the helipad control to determine if there was a helicopter there or coming or going before we flew.

I think in the future, there needs to be a framework that allows technology to take a role for things like unmanned traffic management systems so that these systems, that are operating closer to the ground and operate very differently than aircraft, are visible or somehow integrated into that National Airspace System in a way that maintains the level of safety that exists in aviation now.

I don't have the specific answer to how that will get done. I think we have to let the operators operate first and then start working on integration.

Mr. COHEN. Thank you, Doctor.

Mr. YAKYM. Thank you, Mr. Cohen.

We will now go next to Mr. Johnson for 5 minutes.

Mr. JOHNSON OF GEORGIA. Thank you, Mr. Chairman.

And thank you to the witnesses for your testimony today.

And I am happy to be a part of this hearing, where we are looking into the reauthorization of the FAA and we are focusing on the importance of drones and AAM to the advancement of our Nation.

Drones are used in many ways, including traffic monitoring, search and rescue efforts, and medical assistance.

Another way we have seen them deployed in my home State of Georgia is in response to hurricanes. Georgia Power began incorporating unmanned aerial vehicles, more commonly known as drones, into their hurricane response protocols, and it quickly became a game-changer. Drone pilots can fly the drones to areas they cannot yet access by car or on foot and obtain a bird's-eye view of the power infrastructure damage, and this allows the crews to earlier access what supplies are needed to restore power.

Regarding healthcare, Dr. Ginn, drones are being used by medical professionals in the delivery of medical care, such as getting medicine and lab reports to end-users. Are there other ways that drones are used in the healthcare delivery system? And what are some of the challenges that you want to bring to our attention today?

Dr. GINN. Well, thank you for the question, Congressman.

I think what we have seen in advanced mobility in real life and in our healthcare system, is a lot of potential to create a new layer of flexible technology infrastructure that can support our ability to reach to our patients and into our community in new ways. It is all about the services we can deliver and where we can deliver those services in our communities.

There are obvious high-value use cases we have talked about today—AEDs, lifesaving operations. But I think that the real benefit to healthcare systems and to healthcare infrastructure in this country will be when our healthcare systems have access to this technology and can direct it themselves, meaning can tell us how to use it, how will this technology reach into communities, help solve disparities in access to healthcare, mitigate distance, mitigate transportation deserts, and essentially serve as this flexible layer of infrastructure we can deploy to take care of our patients in our communities.

Mr. JOHNSON OF GEORGIA. Thank you.

Chief Kennedy, drone operations present both risks and benefits to public safety, and you have testified as to benefits. And, in fact, many public safety and security agencies are actively working on

the safest, most expeditious way to detect and mitigate an errant drone.

What can you tell us about some of the challenges that come with operating in airspace with other drones, some of which are errant?

Ms. KENNEDY. Thank you, Congressman Johnson. I appreciate the question.

The challenge that we have in law enforcement right now is with counter-drones. We know who the drones are that are responding from a public safety standpoint, but when it comes to the drones that are out there in the recreational mode, we don't know who those drones are right now.

And the hope is that we are going to have the remote ID shortly. I know the FAA is working on that, and hopefully that will go into play in September. And my recommendation is that, not only should law enforcement drones have remote ID, but all drones should have remote ID. That will be beneficial to law enforcement in knowing who is up in the sky and why they are up in the sky.

In the San Diego region, where we are at, there are many challenges that we face with drones that are coming across the border and dropping packages into our prison systems there. And it is very difficult for us to know who those drones are.

So, we have a lot of work to do, but I am very thankful that we are having these conversations. And we are working with the FAA to have these discussions. I know I will be sitting on the counter-drone FAA committee to have these open discussions about the challenges that we face in law enforcement, on both sides.

Mr. JOHNSON OF GEORGIA. Thank you.

I have run out of time, and I will yield back.

Mr. YAKYM. Thank you, Mr. Johnson.

The Chair now recognizes Mr. Menendez for 5 minutes.

Mr. MENENDEZ. Thank you, Chair.

And I just want to thank all of the witnesses for not just being here today, but also leading on this issue and making sure that we are being thoughtful as a committee about this advance in technology and what it means from a regulatory perspective and making sure that we are thinking about this in a really smart way. So, I appreciate all that you are doing.

Just a quick question, and I am not sure it has been alluded to any of the written testimony or your comments here today.

And I will start with you, Mr. Woodworth.

As we move towards having greater access and greater number of unmanned aircraft—I also sit on the Homeland Security Committee, and the subcommittee I sit on is Cybersecurity and Infrastructure Protection. And so, whenever I deal with new technologies, what I am thinking about is, is there a cybersecurity component to this? Is there a vulnerability that we should be thinking about?

Because a lot of the framework that we have discussed is under our jurisdiction here on T&I and making sure that we are being thoughtful about our airspace and how we utilize it, but I would just love to get your thoughts if there is anything on the other side of the House, in terms of what I personally cover, that we should

be thinking about so we can make sure that we are being thoughtful across the board as we contemplate this new technology?

Mr. WOODWORTH. Thank you for the question, Congressman.

I think to follow up on some of the statements over there from the other witnesses on traffic management and having more aircraft operating in a safe space, there is an important role that UAS traffic management plays in managing that airspace.

And I think that there are a number of good conversations happening. There are a bunch of technologies that already have been demonstrated and built by the industry to show that that works.

On the counter-UAS side, I think that there have been a number of bills put forward. There have been a number of conversations that have happened. I think all have merit on this front. And I think that the topic of counter-UAS is an important one, because you can build all the rules, but if people don't comply with the rules, then what is the next step?

For the cybersecurity side, for us—I can only speak to our experience and solutions. But for us, it was, sort of, the best defense is—to protect—a good offense. It is, like, we have been proactive in designing for assessing different threat environments, looking at what different vectors in the system there may be and mitigating those upfront.

For us in particular, and for a lot of delivery applications, there is no live video link from the aircraft. And there is no, like, person there flying stuff. So, the opportunities to interdict with the aircraft are low by design. And I think that that applies to a lot of the commercial use cases where, when you add in that layer of automation, it provides a layer of protection for nefarious intent.

Mr. MENENDEZ. Sure.

Dr. Cahill, along similar lines, anything you are seeing and that we should be thinking about here in Congress to make sure that we are being proactive in some of the challenges that we may be facing?

Ms. CAHILL. So, Congressman, in terms of the security here, it is something we are very concerned about. And we are flying larger aircraft. So, we are, in May, with one of our partners, going to be flying an autonomous Cessna Grand Caravan. So, we are not talking small aircraft with no hazards associated. So, we are very, very concerned about what the encryption is going to be to make sure that it is not broken.

With most of our smaller drones, our 300-pounders, et cetera, we are not flying with cameras. Just like CEO Woodworth said, we are doing still pictures in a lot of our operations. And, for example, we have flown over 30,000 nautical-miles beyond visual line-of-sight with Transport Canada over the St. Lawrence Seaway looking for North Atlantic gray whales. They are still pictures. And we don't look at the pictures. We have an artificial intelligence program identify the whale on the image and send a lat/long and that whale picture.

So, we are doing our best to avoid collecting anything that would be privately identifiable information. And we are trying to make sure that our links are not jammed, hacked, all of those other things, to ensure the safety of the aircraft and the airspace.

Mr. MENENDEZ. I appreciate that.

And I yield the remainder of my time.

Mr. YAKYM. Thank you, Mr. Menendez.

I now recognize Mr. Van Drew for 5 minutes.

Dr. VAN DREW. Thank you, Chairman. Thank you all for being here today. As you know, I am a big supporter of what you do. And we just want to go forward. We really do.

And I am just—by way of history that you all know already, but I thought it was worth a review. The golden era of American aviation began in 1903—it is hard to believe so much has changed—when the Wright brothers built the first functioning aircraft in Ohio and took off in Kitty Hawk, North Carolina. And 75 years ago, we entered the Jet Age, which dramatically expanded the safety and accessibility of air travel.

Today, we find ourselves on the cusp of the third era of aviation, which will be known as the era of advanced aviation. Advanced aviation is an umbrella term to describe a way of technologies that includes drones, and includes advanced air mobility, supersonics, digital avionics, high-frequency air traffic tools, and many, many others. And it is a new and useful way of describing aviation technologies that have not yet been integrated into our National Airspace System.

The era of advanced aviation will last for the next 75 years. And the harsh reality is that the United States is falling behind, and we can't have that happen. Stakeholders tell me that while we still have the best technology in the world, a complete lack of clear regulation is preventing businesses from investing in the United States of America.

For the United States to lead the era of aviation, we must establish a long-term framework. The current trajectory is unacceptable. If we do not act, we are going to lose our global aviation leadership.

My personal focus on this year's reauthorization is the organizational structure of the FAA. The frank truth is that the FAA is operating on an uncoordinated, 50-year-old organizational model. It should change.

The FAA admitted as much in 2021 when the agency submitted itself a reorganization proposal to Congress. There were serious issues with the proposal. I opposed it, and this committee formally opposed it. However, that proposal made it clear there was a need to improve the organizational structure of the FAA.

I have spent the past 2 years developing what I believe and some others who have looked at it believe is a good plan to facilitate that organizational change. And I don't have to tell you how important the FAA is to me, to my district, to my people, to my employment. My plan will take the Office of NextGen and evolve it into an office of advanced aviation. This office will coordinate technology integration across the FAA. Technology is so important. Congress has been talking about how horizontal integration is important for years. This is a plan on finally how to get it done.

A key component of the plan is to establish an advanced aviation coordination unit. The coordination unit will allow us to build teams of experts from across the FAA to tackle technological changes. My plan also includes the use of the FAA's data portal to create an online clearinghouse system that will allow stakeholders

to track their certifications and submit inquiries related to the status of the project.

This new system allows the FAA to keep track of projects more easily across business lines. With this new system, we will improve the aviation stakeholder experience, stimulate investments in the United States, and put our country in advanced aviation.

There is an updated version of the Advanced Aviation Act coming out soon, and I thank the many people who have worked with me to create a quality piece of legislation. I look forward to unveiling the plan and encouraging my colleagues and industry stakeholders to work with my office, and, of course, the chairman and this committee to see and set the FAA on the right path. We will make sure that the United States leads the world in 21st-century aviation.

I have one question. To Mr. Woodworth with Wing: When you apply for the FAA certification or operational approvals, how often do you end up having the same conversations again and again? Does it seem like the offices that you are interacting with are not always coordinated with each other?

Mr. WOODWORTH. As I said in my testimony, I think that the FAA has a lot of very smart, very hard-working individuals. But there has been a challenging framework of getting to an answer.

So, we started our type certification process nearly 4 years ago. And we are not complete. We finished the flight test program for our type certification almost 2 years ago. And that data exists.

So, I think that there is lots of room to improve that process, to provide clarity, to provide single-threaded decisionmaking. And we welcome any proposals that help facilitate that.

Dr. VAN DREW. Thank you.

Thank you, Chairman. I yield back.

Mr. YAKYM. You bet.

I now yield 5 minutes to the ranking member of the full committee, my distinguished colleague, Mr. Larsen.

Mr. LARSEN OF WASHINGTON. Thank you very much. I will try not to take 5 minutes because I get the privilege to blow in here and blow out of here and cut in line. So, I know how angry people are right now, my colleagues are, for cutting in line.

But, Dr. Cahill, in your testimony, you testified about not supporting the expansion of the number of test sites. Can you talk a little bit about that?

Ms. CAHILL. Certainly, Ranking Member Larsen. The test sites right now—there were seven test sites that were set up to support the FAA and constituents doing tests and evaluation of aircraft. And when it was set up, we were given the authority to be able to expand our operations to other areas across the country.

And so, the University of Alaska and the Alaska test site have brought in ranges and operations in States across the country: Kansas, Mississippi, Oregon, Hawaii. We have got sites in Texas, Arizona. We are working on Pennsylvania.

So, we already have the ability to bring other organizations into the test site program under the authorities already granted our test sites. That would bring them in under the umbrella of policies and procedures that are already well-established and have proven a very strong safety record.

Mr. LARSEN OF WASHINGTON. And this applies not just to the Alaska test site, but to the other six?

Ms. CAHILL. All seven test sites have that authority.

Mr. LARSEN OF WASHINGTON. Awesome. Yes.

And then one of the other restrictions that we had a discussion of yesterday—it is kind of a sensitive topic around here—but you need to test drones regardless of where those drones are made because sometimes you need to test them, to blow them up, right? Or to do something with them so we understand what they can do. And in part, that is some of the DJI Chinese-made drones, which is about 80 percent of the market. And you are restricted from doing that. Is that correct?

Ms. CAHILL. That is correct. So, for counter-drone testing right now, it takes nearly an act of God in order to get an approval to buy one of the foreign systems that is on the list of banned manufacturers. But we need to be able to do the destructive testing, especially the counter-drone testing, because they are 80 percent of the market.

We see them being used very effectively right now in the war in Ukraine, and we need to make sure, for the sake of our national security, that any counter-drone systems we are deploying in our airspace are effective at removing those particular drones from the airspace without adversely impacting aviation safety and the safety of the NAS.

Mr. LARSEN OF WASHINGTON. So, it ends up being a national security and a homeland security issue?

Ms. CAHILL. It is a national security, homeland issue. But the five authorities right now that can do the counter-drone testing and evaluation are DoD, which has an exemption provision, DHS, DOE, DOJ, and for a very limited five airports, FAA.

Mr. LARSEN OF WASHINGTON. Yes, right. Thanks. I just wanted to bring that up and just get it on the record because it may be something that we have to discuss and walk through as part of FAA reauthorization, or not. But I wanted to be sure that we aren't ignoring that limitation that could actually advance our security if you were allowed to do destructive testing. Yes.

Thank you very much. I yield back.

Mr. COLLINS [presiding]. Thank you, Mr. Larsen.

The Chair now recognizes myself for 5 minutes of questioning.

As we have been talking to people in hearings or just in person, there is this common theme. It really doesn't matter which group I am talking to or which committee I am representing and talking to people about. It seems like that we have certification problems left and right. We have an agency that is not up to date or doesn't seem to want to get up to date or modernize and use the newest technology. We have Europe, who is—you are able to get things certified quicker, and then get it to the U.S., and then get it certified here. And it shouldn't be that way. Or we run into permitting problems, or we run into the same thing that I hear over and over and over again, and it is China. The China problem. So, I think what I want to focus on real quick and for the next minute or two is just China.

Chief Kennedy, during my discussions with UAS manufacturers, I keep hearing that China has cornered a substantial share of the

drone market and that law enforcement agencies are being forced to buy Chinese drones and rely on that technology produced and funded by the CCP. Is law enforcement generally concerned about using Chinese technology?

Ms. KENNEDY. Certainly, we are concerned. And so, we take precautions in that area.

So, right now, for the DFR drones that we use, the only drone that is capable with the optical zoom lens to get into the 200 zoom optical lens is the DJI Matrice 300 that we use. So, what we have done at our department is we use—our drones do not utilize the onboard software from the drone manufacturer. From the onset of our program, we took that into consideration. We have used an encrypted U.S.-based software program to bypass the drone manufacturer systems. Our data is encrypted and is stored on U.S.-based servers that meet Federal requirements for confidential law enforcement databases.

So, if there was an alternative for us, we would certainly be willing to use that alternative. But I think we are, quite frankly, to be just to the point, there is discussion, and there are U.S. drone companies right now working towards that. We keep hearing that it is just around the corner. But we have not seen that. If we were banned from using DJI drones right now, it would halt us. We would not be able to fly the DFR mission.

Now, certainly there are other drones that we use for tactical operations. We call those reactive drones. Those drones can be used on SWAT operations, or to search into buildings and canyons. But DJI drones right now are the only option that we have.

Mr. COLLINS. Good. I think that is going to tee up my next question for Mr. Woodworth.

Why does China have such a large share of this drone market?

Mr. WOODWORTH. I think that some of it can be placed on the regulatory environment in the U.S. Up until part 107 existed, there wasn't a path to fly drones commercially in the United States. It just didn't exist. And so, there was a multiyear gap where use cases weren't possible in the United States. And so, I think that other developers got an advantage on that front.

I think some other elements of it are just related to the globalization of the supply chain and where most consumer electronics are built today. But I think the industry, as a whole, is starting to see us pull away from that and into more U.S.-based manufacturing. We—

Mr. COLLINS [interrupting]. Let me ask you this way because I am running short on time.

Mr. WOODWORTH. Yes.

Mr. COLLINS. I listened to your opening statement. How is the FAA hampering development and integration of new unmanned systems to American airspace?

Mr. WOODWORTH. I think it really is—it comes back to Chairman Graves' opening statement of, like, we are a student trying to take a test, and we don't know what the subject is. So, it is, like, I don't know if I am going to walk in the room and it is going to be a biology test or a spelling bee. I think it is that predictable nature of it that is really hampering the industry at the moment.

And so, anything that this committee can do to help facilitate making that process more predictable, more pragmatic, would be super helpful.

Mr. COLLINS. All right. Thank you. That is all I have. I yield back.

The Chair yields 5 minutes to Ms. Titus.

Ms. TITUS. Thank you, Mr. Chairman.

I would like to ask Dr. Cahill, I believe you were on the FAA's Beyond Visual Line-of-Sight Operations Aviation Rulemaking Committee. And I noticed there are some people who aren't real happy with some of the recommendations that came out of there for coordinating different types of aviation and who has the responsibility and the right-of-way.

I think in my own district, which is Las Vegas—the Las Vegas strip includes the airport. So, you have got commercial aviation. You have got general aviation. You have got helicopters flying down the strip and out to the Grand Canyon. And now you are going to have drones in that airspace.

Could you talk a little bit about how that process worked, and how everybody has kind of got a seat at the table?

Ms. CAHILL. Congresswoman, thank you for that question. I would be happy to.

In the rules-of-way aspect, there are a lot of diversity of opinions. And what came out of the Beyond Visual Line-of-Sight Operations Aviation Rulemaking Committee—also known as the BVLOS ARC—the recommendations—we, as the University of Alaska, did concur that we could live with the recommendations that came out of it. But there are definitely concerns in terms of some of the recommendations, especially in that low-altitude airspace.

For us, we are, in Alaska, not really looking at that high-density operation with the helicopters on the strip. What we have is a whole bunch of pilots flying under 500 feet because, in the rules and regulations as they stand in the FAA, it is legal to fly under 500 feet because we are in a rural area.

And the crop dusters—I grew up in northern California. They fly under 500 feet, and they also fly under power lines. So, if you start talking about shielded operations, there is going to be a shift in the way some people need to approach this. And that is part of the challenge. It is, how do you balance the need for people to do operations at low level with communications between drones that may not have detect-and-avoid and manned aircraft, and also, at the same time, allow everybody to have access to the airspace?

And so, that was the major debate, is how did we ensure that? And it may vary, depending on where you are. If you are in a highly urban environment where aircraft are not supposed to fly within 500 feet of a structure, you may have a very different situation than you have in Alaska. And so, anything that comes out in those rules and recommendations really does need to be balanced for where you are operating and how you are operating.

Ms. TITUS. What is the kind of timeline for putting these in place? Or what are the next steps now that you have got all this input?

Ms. CAHILL. So, at the end of the Aviation Rulemaking Committee process, we handed our recommendations over to the FAA.

And I think we were told that it would be probably about a 2-year timeline to be able to work those through the FAA process, to come up with a series of rules and regulations, put them out for public comment, and then be able to finalize the recommendations.

Ms. TITUS. OK. Well, thank you. I hope they don't push off that deadline like they have done so many times—2 years, 2½, 4, whatever.

Also, I want to ask you about the test sites because Nevada was one of the original seven test sites. And they have agreements with UNLV, DRI. It seems to be working pretty well.

But do you think they have been successful? Do you think there is anything we can do to help them push aviation along or bring more people involved as stakeholders with them? I know in Alaska, it sounds like they have been pretty successful. Could you give us some best practices, maybe?

Ms. CAHILL. We would be happy to help the folks at the Nevada test site. They, of course, just moved it from UNLV up to UNR, which is my alma mater for my Ph.D.

Ms. TITUS. Oh, really?

Ms. CAHILL. And we would be happy to assist. It is a case where, I think, the university has grabbed it, and you definitely have some players in industry that are based in Reno who are furthering their efforts. So, I think there are things that we can do to help assist them and get them stood up. The new 44803(c) waivers that we just got, we can help work with them to try to get to a point where they can operate with those waivers.

Ms. TITUS. I agree with you. I don't think we necessarily need to create more test sites, but we need to plus-up the ones that already exist and help them do better, because when they were first created, they didn't do much for the first couple of years because we didn't quite know what to do. But now, it sounds like they are getting more in the game.

Ms. CAHILL. If I can respond to that one, Congresswoman. The FAA never funded the test sites. So, the fact that we have seven test sites still in existence is in tribute to everybody busting their tails in order to get funding in and to really work hard to try to advance this. These are passions because it would have been very easy to walk away.

Ms. TITUS. Well, thank you very much.

I yield back.

Mr. YAKYM [presiding]. Thank you, Ms. Titus.

The Chair now recognizes Mr. Payne for 5 minutes.

Mr. PAYNE. Thank you, Mr. Chairman. And I would like to ask some questions about how uncrewed aircraft can be integrated into a dense urban environment, like my hometown of Newark, New Jersey. Our airspace has to manage commercial airliners from Newark Liberty, emergency response, and sightseeing helicopters, and general aviation aircraft as well. The addition of UAS to this congested airspace presents challenges that will have to be overcome together.

Chief Kennedy, how has your department been able to work with other operators in your airspace as you expand your UAS operations?

Ms. KENNEDY. Thank you, Congressman Payne. We are very blessed in the city of Chula Vista. We are Golf airspace, which is the best airspace that you can fly in. But we do work very closely. Every day, we notify the Notice to Air Missions daily by calling the towers, and we share our daily operations with them and the entire city. So, we make sure that we are working together on that, as well as we file NOTAMs on an annual basis.

But more importantly, I have even had the opportunity—we fly from 150 feet to 400 feet in Chula Vista. I am familiar with other agencies. There are only about 20 agencies in the United States that fly DFR operations right now. So, we are very much in a new process of going outside the norm of what we do.

I just had an opportunity to travel to Georgia. The Brookhaven Police Department, they fly in Delta space. So, they have other challenges in that area. But when you work together as a team, and you coordinate, and you make sure that you are contacting the right authorities, you are able to work through it.

And the whole goal is to have the ability for our law enforcement partners and our fire partners to make sure that we are getting to our community when they need us most, and we are sharing the accurate information about what emergencies that we are dealing with so that everybody goes home safely. That is our goal.

Mr. PAYNE. Thank you. And can you please share how you engaged with your community as you began drone operations? What sort of feedback did you receive, and did you chance any operations based on that feedback?

Ms. KENNEDY. Yes. Thank you very much.

We started working with our community in 2015 well before we ever put one drone in the air. And we reached out to many of the activist groups in our community and invited everyone in. We had forums. We had open discussion. We wanted to find out what our community really wanted. Were there concerns?

And as we have continued, as we have received some national and international interest, it has brought on an interesting conversation with many people. And there are tremendous concerns with the community in regards to privacy.

And what we do in Chula Vista is we listen to our community. We have the ability to have them send us emails through our UAS website as well as provide a lot of information through our webpage that gives flight data. So, the community can actually go and see where we flew. Usually, 4 hours later, they can see where we went, why we went there.

Mr. PAYNE. OK.

Ms. KENNEDY. And so, it has been interesting to hear concerns.

And I heard people mention earlier about the backyards and people looking into their backyards. And like I said, we fly from 150 feet to 400 feet.

Mr. PAYNE. Right.

Ms. KENNEDY. And what happened is we decided that—you know what? I can understand why the community feels that way. So, as we return on a flight, automatically, when we push the “home” button, we return, and our cameras tilt upward to the sky.

Mr. PAYNE. OK.

Ms. KENNEDY. And we don't want the community to think that we are looking in on them.

Mr. PAYNE. Thank you. My time is dwindling. Let's see.

Mr. Woodworth, can you please share with us how UAS operators can engage in beyond visual line-of-sight operations in a densely populated urban environment?

Mr. WOODWORTH. Thank you for the question, Congressman.

Mr. PAYNE. Very quickly, as my time is—

Mr. WOODWORTH [interrupting]. All right. Right now, today, we do it in the Dallas-Fort Worth area. That happens to be what most call the Mode C veil. So, all the aircraft that are operating in there are equipped. Our airplanes have ADS-B in on them so we can listen for crew traffic, and our operators have displays where they can also look for crew traffic. So, we do a lot of aviation outreach. We have built technologies to help facilitate that cooperative airspace.

Mr. PAYNE. OK. Thank you.

And I will yield back.

Mr. YAKYM. Thank you, Mr. Payne.

The Chair now recognizes Mr. Westerman for 5 minutes.

Mr. WESTERMAN. Thank you, Mr. Chair. And thank you to the panel today.

Mr. Woodworth and Dr. Cahill, I have the most agricultural aircraft operations per capita in my district than any other district in America. While I am supportive of new entrants to the national airspace, including UAS, I am concerned about the FAA possibly allowing drones to have the right-of-way in the sky.

Agricultural aircraft routinely fly at low altitudes. And in a 2015 study by the University of Colorado, manned aircraft had trouble finding and tracking smaller sized drones. I don't want drones to be put at risk, and I certainly don't want pilots and manned aircraft to be put at risk.

I am concerned about the Beyond Visual Line-of-Sight Operations Aviation Rulemaking Committee's recommendations to allow drones to have right-of-way in the air in certain circumstances. Safety of manned aircraft seems more important to me than drones. I just want to know if you both can discuss that issue?

Ms. CAHILL. I guess, Congressman, I get to take the first shot at this one.

In terms of the operating with manned aircraft in these areas, there are, it looks like, some technological advantages, which will allow us to be able to cooperatively share the airspace. But it is going to take cooperation in order to do this.

And so, for us to know that there are, for example, crop-dusting operations occurring in an area, we would most likely try to avoid that area. If we know where your aircraft is, we can avoid you. It is the cases where we have noncooperative traffic, where people have not told us where they are, they are not broadcasting, they haven't filed anything saying they are flying in that area—that is where it becomes a challenge. Because drones, by and large, can't carry detect-and-avoid technology on them and be able to do the mission they need to do.

The weight of the current detect-and-avoid technologies is fairly high. And you want to make sure that you are able to actually use

the drone for what you need it for. So, it needs to be a lot of communication and potentially reserving of airspace to make sure that both the drones and the manned aircraft can be flown in the same area without there being a potential for conflict. The last thing we want is a collision.

Mr. WESTERMAN. Right. Have you been to an agricultural aviation—have you seen a crop duster? I have ridden on one. It is a whole other world. But I would encourage you to get out in the field and talk to the agricultural aviation pilots and to understand how their business works. And there are some great complexities, I believe, in trying to maintain communications and to keep traffic where traffic should be and not have these collisions, which would be devastating.

Mr. WOODWORTH. Yes, sir. It is a very important conversation to have. And I think that, as Dr. Cahill said, as you brought up, that learning experience and the communities talking to each other is a foundational element of all of this.

So, we were a participant in the ARC, as you were. And we are a strong supporter of the work done, but we do recognize that there are a number of recommendations that there wasn't full agreement on.

We think that, as an industry, there is this common goal and advantage of having airplanes know where other airplanes are, and there are a number of technical solutions that are emerging to help facilitate that. So, we welcome the conversation. We want it to be a cooperative airspace. We want to do the right thing so that we are not disrupting parts of the aviation ecosystem that have existed for a long time.

I came out of aviation. All of my best friends are pilots. It is, like—I understand the problems. And I want to make sure that we, as an industry, are bringing solutions, and we are doing it with an open mind and an open conversation.

Mr. WESTERMAN. All right. These agricultural aircraft, you can think of them like tractors in the air and not very high off of the ground. And they do very, very important work, especially in my district. So, I hope you all will take note of that and work on the right solutions so that everybody wins in this situation.

Thank you, Mr. Chair. I yield back.

Mr. YAKYM. Thank you, Mr. Westerman.

Are there any further questions from members of the subcommittee who have not been recognized?

Seeing none, what I would like to do is, for a few minutes, enter into a second round of questioning. And I yield myself 5 minutes for further questions.

Dr. Ginn, aside from being a surgeon, you were also a former commercial airline pilot, as I understand it. Can you speak to some of the concerns that pilots have with drone operations and how we may be able to lay some of those concerns to rest?

Dr. GINN. Sure. And thank you for the question. It has been a long time since I have been an airline pilot, but I am an active aviator. And I can tell you that, obviously, pilots and aircrews are quite concerned about encountering an uncrewed aircraft at the wrong place and at the wrong time, perhaps not unlike we are concerned about encountering a large bird or a flock of birds.

The concerns are valid. I do think there are operational considerations that make it highly unlikely. For one thing, obviously the risks are higher in terminal areas for aircraft. You know, departing and arriving in airports. And so, airspace restrictions are already tighter in those areas and presumably would remain so for unmanned aircraft.

There is also maybe the fact that unmanned operations may be separated to some extent from regions of the airspace where manned aviation occurs currently. So, I think in reality, it is unlikely and rare for them to encounter those aircraft.

However, I do think it would be important to have systems and technologies available that essentially create visibility bidirectionally between those aircraft, similar to ADS-B, which is a system that allows aircraft to see each other electronically without onboard radar.

And surely, there can be solutions in terms of increasing that level of transparency so that everybody operating in the airspace is aware of everybody else. And to some extent, that can be automated.

Mr. YAKYM. Great. Thank you.

And my second question is for Chief Kennedy. When you send a drone out to a scene, how do you coordinate with air traffic control and other manned aircraft to ensure that safety is maintained?

Ms. KENNEDY. It is constant communication that we have. And we yield to manned aircraft. That is what we are trained to do. It is important. We are always going to yield that way. We are able to monitor through technology and mitigation systems that we have at our department, and that is what our teleoperators and our pilots are trained to do.

And so, when we fly, as I mentioned before, 150 to 400 feet, many of the people—I was on a helicopter the other day, and as we started flying back into Chula Vista, they immediately gave the notification to that pilot that there is low-flying aircraft in the area. And it made me feel safe that we were all working together. So, I think it is a coordinated effort.

Mr. YAKYM. Great. Thank you. And I yield back.

Are there any other Members who would like to be recognized for a second round of questioning?

The Chair recognizes the ranking member of the full committee, Mr. Larsen.

Mr. LARSEN OF WASHINGTON. Yes. Thanks.

And this question is for the Chief. It is related. Because one of the conflicts that we hear about isn't between, say—although we hear about it, the presence of an airplane, the presence of a drone in the airspace. Another conflict that we have is the presence of State and local governments trying to regulate airspace versus the Federal Government through the FAA being the sole regulator of the airspace.

And so, part of addressing that is ensuring you are doing outreach to your local communities to say, this is the program, this is what we are doing.

Can you explain to us a little bit—maybe some lessons you have learned about doing outreach to your community to alleviate con-

cerns? Either privacy concerns or any concerns about you operating in the airspace.

Ms. KENNEDY. As I mentioned earlier, the community and the voice of the community is extremely important. We are only as good as the support that we have from our community. And so, we do a lot of outreach with our community.

And our dashboard is one of the ways that shares—hopefully you have an opportunity to look at our website and look at all the information we provide. The flight data, where we go, all the frequently asked questions, how you can reach out to us, what the concerns are.

I have even had many of the people from the activist community come to my department, and we have conversations. And I want to hear, what are best practices for law enforcement? What things are concerning you? And we make changes based upon that because we are in a new territory right now.

And so, I think it is just important to have that communication and have that opportunity to share, and for them to come in and actually see what we are doing. Because if you don't see it, you might visualize it completely differently than what we are doing. We put a lot of effort into protecting our community in the skies as well as on the ground, and the information we share is making a huge difference.

Mr. LARSEN OF WASHINGTON. I didn't catch it in your testimony. How many other police departments have something similar?

Ms. KENNEDY. I believe right now, there are approximately 20 DFR agencies throughout the United States. It is very new technology. Like I said, we were the first to do it. We have trained probably close to 60, 65 agencies that are coming to us and learning from us and the best practices.

And we believe—I am so passionate about what we are doing and what it means for our community. I am just so thankful to have an opportunity to be here before Congress to explain what we are doing.

Mr. LARSEN OF WASHINGTON. Yes. And we are pleased to have you. And I want to go back to my main point.

It is the conflict between local and State governments certainly legitimately being responsive to their constituents about concerns about drones in their airspace, but as for regulating airspace, it is important that we have a single regulator of that airspace and don't create a patchwork of rules. We do that well enough already, and we don't need help doing the patchwork bit.

So, I think what you are talking about, there may be some lessons learned that can alleviate the pressure for other local elected—

Ms. KENNEDY [interrupting]. Right. We don't want them to have to reinvent the wheel. We want to share what we have done, what has worked, what hasn't worked, what the challenges are, and that is what we have been doing.

Mr. LARSEN OF WASHINGTON. Yes. Great. All right.

Thank you very much. I yield back.

Mr. YAKYM. Thank you, Ranking Member Larsen.

Are there any other Members who wish to be recognized for questioning?

Seeing none, that concludes the first panel for today. And I would like to thank each of our witnesses for your testimony.

I would now like to ask our second panel of witnesses to please take their seats.

[Pause as second panel takes their seats.]

Mr. YAKYM. All right. Our second panel today consists of experts in the electric aircraft powered-lift space. These aircraft are likely to enter commercial operations in the next few years and will start their operations with a pilot on board.

Unlike drones, these AAM aircraft will be able to communicate with air traffic and can operate under traditional flight rules. This is a distinction worth drawing between this panel and our previous panel.

I would like to welcome our witnesses and thank them all for being here today. I would like to take a moment to explain our lighting system to our second panel. There are three lights in front of you. Green means go. Yellow doesn't mean slow down. It means you are running out of time, so, hurry up and wrap it up. And red means that you should be concluding your remarks.

I ask unanimous consent that the witnesses' full statements for the second panel also be included in the record. And without objection, so ordered.

As your written testimony has been made part of the record, the subcommittee asks that you limit your oral remarks to 5 minutes.

And with that, Mr. Kyle Clark, you are recognized for 5 minutes for an opening statement.

TESTIMONY OF KYLE CLARK, FOUNDER AND CHIEF EXECUTIVE OFFICER, BETA TECHNOLOGIES; JOEBEN BEVIRT, FOUNDER AND CHIEF EXECUTIVE OFFICER, JOBY AVIATION; CHRISTOPHER BRADSHAW, PRESIDENT AND CHIEF EXECUTIVE OFFICER, BRISTOW GROUP INC., ON BEHALF OF THE HELICOPTER ASSOCIATION INTERNATIONAL; AND CLINT HARPER, ADVANCED AIR MOBILITY EXPERT AND COMMUNITY ADVOCATE

TESTIMONY OF KYLE CLARK, FOUNDER AND CHIEF EXECUTIVE OFFICER, BETA TECHNOLOGIES

Mr. CLARK. Excellent. I have been trying to teach my kids that yellow means slow down, so, it has been an experience teaching them to drive.

Thanks for having me here. It is really meaningful for you all to take the time to listen to the important stuff that we are working on in electric aviation. And I am excited to be here with my friend JoeBen and Chris, one of our customers at Bristow, and to talk a little bit about what we are doing at BETA, and also, why it is so important to focus on this industry as a Nation.

The future of aviation across the world is going to be electric. It is clean. It is reliable. It is sustainable. There are more and more reasons that we are realizing through test and development as to why electric is the future of aviation. And electric, by the way, is not just battery electric. It includes hybrid. It includes hydrogen electric. And it is exciting because electric is fundamentally safer, it is more reliable, it is more cost-effective, and it is sustainable.

There are not a lot of reasons not to lean into electric aviation. It is not for every mission today, but it is getting there.

I am from BETA Technologies. We are up in Vermont. We are a—I used to say small company, but we are growing. There are about 500 engineers back at BETA right now likely watching—some of them watching this with bated breath, looking for clarity from the FAA on how to go about completing the mission that we signed up to pursue.

And that is what I am effectively here to ask for, is for this committee to provide direction, funding, and to compel the FAA to lean into the resources and the expertise to certify electric propulsion.

At BETA, we have taken a little bit different of a track towards AAM. Mr. Larsen, as we have talked in the past, we are focused on rural access, logistics, cargo, medical applications. First, with fixed-wing aircraft, and then moving into aircraft to take off and land vertically. And then moving into urban air mobility and passenger missions. It is a mission—cargo and logistics—that we can solve today.

And that is why we have leaned into that. It is pragmatic. It is simple. And with a little bit of regulatory unblock—and I am not asking for anything special for our industry. Just simple clarity. Simple clarity and a stationary goalpost gives us the ability to execute on our mission.

We all know, and we have heard about it a lot. America has a history of innovating in aviation. And that innovation is driven to more economical, more sustainable, and most importantly, safer and safer aircraft. Again, electric is fundamentally safer.

At BETA, we developed a battery system that—we partnered with the FAA and NIAR, the National Institute for Aviation Research, to drop a full-voltage battery from 50 feet, and it passed on the first test. And that is pretty remarkable. That didn't happen with gas-powered airplanes, it turns out. It took a long time to get to the level of safety that we are starting from. There is a fundamental foundation of an engineered product and a battery in our case that we can build a safety platform from.

I think it is also important to note that we at BETA are not just focused on the aircraft. We are also focused on the charging systems, on the training of the pilots. And these are two more areas that the FAA needs clarity on allowing this to flourish.

The vertiport standards that have been published in draft form are ambiguous and not necessarily helpful to the industry. They are divergent from existing heliport standards. And the pilot licensing requirements are—although there has been progress made in the SFAR, it hasn't been absolute clarity, certainly not to the point that allows us to work with our customers and advance that discussion.

The interesting thing about this industry is that a lot of people don't think it is real. We have been flying our aircraft all across the country. Out in California, JoeBen is flying their aircraft daily. We are flying multiple aircraft daily up in Vermont.

And it is interesting. We flew across to Missouri. We flew down through Arkansas. And the most common response we get when we get to airports—people will come over and be like, what are you

guys doing? That thing is electric? And his face just, like, drops. It is an amazing thing.

When Secretary Buttigieg sat in our aircraft, he looked at me and said, you flew this here? And this was down in Louisville from Vermont on our own charging network. We built the network half-way across the country. It is coming down the east coast. The Department of Health and Human Services has supported a network with us from Florida across to Mississippi. It is real. It is here. And we are making the transition at BETA from being an engineering company, and the entire industry is moving into a manufacturing industry. And we are bringing the aircraft.

What we need is a simple regulatory unblock in clarity. That is it. It is not complicated. The technology is here, and we are ready to get to work.

[Mr. Clark's prepared statement follows:]

**Prepared Statement of Kyle Clark, Founder and Chief Executive Officer,
BETA Technologies**

Thank you for the opportunity to testify on behalf of BETA Technologies at today's hearing titled "FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People." Our nation is at a pivotal moment in aviation history where we have the chance to maintain—and expand—our global leadership in the race for innovative aviation technologies, so long as we have a clear regulatory pathway and support from the government to get there. I appreciate the chance to testify as Congress considers the role of new entrants in FAA Reauthorization, and look forward to sharing how Advanced Air Mobility will benefit communities across the country.

BETA Technologies ("BETA") is a leading developer and manufacturer of electric aircraft, electric motors, and multimodal vehicle charging infrastructure based in the United States. Burlington, Vermont is home to our R&D headquarters as well as our primary production and manufacturing facility. We currently have over 500 employees spread across a footprint that extends beyond Vermont, including: Plattsburgh, New York; Springfield, Ohio; Raleigh, North Carolina; and Washington, DC. We have raised significant capital from American investors to build our electric aerospace company and, in turn, develop American-made technology and the jobs to go along with it.

BETA is building a fully integrated electric aviation system that we're selling to many of the top aircraft operators in the world. Our products include: the CX300, an electric fixed-wing aircraft, or conventional takeoff and landing aircraft (CTOL); the ALIA-250, an electric vertical takeoff and landing aircraft (eVTOL); multimodal charging infrastructure; and, a program to train future pilots and maintainers. These Advanced Air Mobility (AAM) technologies will unlock connectivity for communities all over the United States, increasing access to healthcare, e-commerce, and passenger travel.

We have firm orders from operators including UPS, Bristow, United Therapeutics, BLADE Urban Air Mobility, and more. We are also partnering with the U.S. government to explore government use cases and accelerate the deployment of AAM aircraft and multimodal electric chargers to service both ground vehicles and aircraft.



BETA Technologies is developing two all-electric aircraft models.

BETA's approach capitalizes on three major benefits of electric flight: significantly lower operating cost compared to jet- or turbine-powered aircraft, zero operational emissions, and a fundamentally safe and reliable option for aviation. Advances in aviation technology have often been hindered by regulatory hurdles, prolonged timelines for certification and commercialization, and a lack of ability for small businesses to contribute to the industry. But a surge in ingenuity, government partnership, and American investment has inspired a more economical and sustainable era of aviation.

Our country is at a defining moment in history to recognize the economic, healthcare, and environmental opportunities of Advanced Air Mobility. If our government can help us harness this innovation, the United States will remain uniquely positioned to become the global leader in emerging aviation technologies.

ELECTRIC AVIATION IS HERE

BETA is focused on creating solutions that enable operators to bring the same expedient delivery, healthcare, and passenger capabilities available in urban areas to Americans in rural and hard-to-reach places, all while lowering cost and reducing emissions. Our simple, reliable, and safe electric aircraft and charging infrastructure provides that solution. This technology has matured to a level that enabled BETA to fly our aircraft halfway across the country multiple times—using our charging infrastructure along the way—to introduce electric aviation to communities all over the country.

Eliciting Critical Thinking in Electric Aviation

BETA's initial aircraft design was driven by a desire from United Therapeutics (UT) to transport organs in a reliable, efficient, and environmentally friendly way. UT, a biotechnology company founded in Maryland, is developing an unlimited supply of organs for transplant by using advanced materials and 3D printing to repair organs for transplant, significantly increasing the availability of these life-saving products for patients in need. Initially, BETA and UT signed a contract to elicit critical thinking in electric aviation. This resulted in BETA's first eVTOL prototype, AVA, which we designed to demonstrate the ability to carry organs from manufacturing facilities to hospitals. We went from an initial concept to our first flight test in just ten months, ultimately completing over 100 record-setting flights.

UT became BETA's first customer and, since then, we have evolved our design by applying our learnings to create two highly-efficient, simple, and certifiable aircraft models that are advancing through the Federal Aviation Administration (FAA) certification process right now.

Demonstrated Technical Progress

BETA has been flying electric aircraft for more than five years, and in that time we've reached a number of technical milestones. Currently, we have two full-scale pre-production aircraft that we fly nearly every day, logging more than 22,000 miles on our fixed-wing airplane to date. Last year, we completed a successful hover campaign on our current eVTOL pre-production aircraft, and test pilots from the FAA, U.S. Air Force, and U.S. Army have flown our fixed-wing airplane. A market survey certificate from the FAA has put our engineering to the test, allowing us to fly our

fixed-wing prototype on multiple real-world flights, stopping at municipal airports along the way in New York, Ohio, Indiana, Illinois, Missouri, Kentucky, and Arkansas to introduce this technology to both rural and urban communities.

Real-World Use Cases with Real-World Partners

AAM marks a transformative era not only for the aviation industry but the entire U.S. transportation system. It unlocks access and new capabilities, shifting the paradigm in how we move goods and people within and between our communities. For BETA's customers, this means quickly delivering organs for transplant for patients in Missouri, a quiet, clean transportation option for passengers between rural and urban areas in the Pacific Northwest, additional disaster response in hurricane-prone areas in Louisiana, and increased e-commerce capabilities in hard-to-reach places in Tennessee.

Showing the real-world use cases for electric aviation has garnered firm orders for our aircraft from commercial customers. *Bristow*, a leader in global vertical flight solutions currently offering helicopter transportation for civil and government services, will use both versions of BETA's aircraft to safely and reliably move passengers and time-sensitive cargo to strategic locations between regions in Louisiana, Texas, and Florida. *UPS* will use BETA's eVTOL for point-to-point logistics to transform the middle mile express cargo industry, drastically reducing the risk, complexity, and handling for missions and provide relief for over-loaded systems, extend drop-off and pick-up times, and enable more Premium Direct service to rural areas. *United Therapeutics* will use both versions of BETA's aircraft to deliver organs safely and quickly between its facilities and hospitals. *BLADE Urban Air Mobility* will use BETA's eVTOL to quietly and safely transport passengers in a sustainable way.

We're also gaining traction with our government partners as they work to meet modern-day challenges. We're partnering with the *Administration for Strategic Preparedness and Response (ASPR)*, an agency within the U.S. Department of Health and Human Services (HHS), to deploy multimodal charging infrastructure that will support public health preparedness along the gulf coast, including Mississippi, Georgia, Florida, Arkansas, and Alabama. This will enable eVTOLs to transport medicine, patients, and equipment in a disaster-response role in hurricane-prone areas.

Our contracts with the *U.S. Air Force* and *U.S. Army* through the *Agility Prime* program allow DOD to exercise military use cases for electric aircraft and multimodal charging infrastructure to support critical resupply and strategic personnel transport. Agility Prime has been an essential part of BETA's success to date, accelerating our progress and spurring commercial investment as we seek FAA certification for our aircraft. The practical features of BETA's eVTOL—including runway and fuel independence and a low noise profile—make it a valuable and versatile solution in defense applications.

BUILDING A NATIONWIDE CHARGING NETWORK

What good is an electric airplane if you have nowhere to charge it? To ensure access to widespread, publicly available charging, BETA is developing rapid charging stations that are nonproprietary and use an existing electric vehicle (EV) standard in use by other Original Equipment Manufacturers (OEMs). BETA is partnering with airports, Fixed Base Operators, and our customers to deploy this technology and make the future of electric transportation a reality. Moreover, we're working with other electric aircraft OEMs to collaborate on infrastructure deployment early in the commercialization of electric aviation.

BETA is installing publicly accessible multimodal chargers at general aviation airports across the nation. We currently have sixty five sites permitted, under construction, or online and charging. The first route is already built and operational—spanning from Vermont to Arkansas—and this year we'll complete the east coast network and connect Florida to Missouri.



BETA's Charge Cube, equipped with a 50-ft. retractable charging reel.

Multimodal and Interoperable

To prepare to meet the demands of electric aviation, BETA has designed the Charge Cube, which safely and efficiently charges electric aircraft as well as ground-based EVs including cars and buses. This charger abides by universal charging standards so that it can be utilized on any EV that is Combined Charging System (CCS1) compliant.

BETA's charging stations are already being used in both on- and off-airport environments to help electrify critical segments of our nation's transportation system. For our fleet customers like UPS, it gives them the option to charge their electric ground fleet (i.e., delivery trucks and vans) and meet their emission reduction targets. This technology, especially in mobile, "deployable" form, is also being explored by the DOD to meet its energy demands at military bases and installations and provide flexibility in austere locations.

Publicly Accessible Chargers at Airports

The footprint of BETA's Charge Cube is minimal yet effective, making it sought-after by other electric aircraft OEMs and a seamless integration into existing airport infrastructure. At four feet tall, this charger is designed to fit underneath an aircraft wing and offer an immediate touchless experience to users. It quickly powers aircraft by providing continuous 350 kilowatt output which will enable BETA's aircraft to charge in just 50 minutes.



A pilot plugs the all-electric ALIA aircraft into BETA's Charge Cube.

Because it is multimodal, BETA's charging infrastructure gives airports an edge as they seek to electrify. It powers their EV ground fleets today while giving them the tools necessary to adopt the next generation of aviation technology. Moreover, multimodal charging allows airports to offer additional services and amenities to their surrounding community. In the future, it will help attract more pilots and air traffic.

Perhaps the best demonstration of this dual purpose is BETA's charging installation at the Springfield-Beckley Municipal Airport in Ohio: a charger in the parking lot provides the only Level 3 fast charging between Dayton and Columbus, seeing frequent use from electric cars and trucks, while the charger located on the airport apron powered BETA's electric aircraft during several missions that passed through Springfield. In these cases, both aircraft and ground vehicle chargers are able to use the same power source and converter.

Airports like the one in Springfield are vital to connecting our nation's communities. The local airport is an essential way for people and businesses to stay commercially connected to the rest of the country and serves as a lifeline for medical response, cargo, and other critical services. By placing chargers at airports in rural and suburban areas, airports can become part of the adaptation to EVs and residents can gain access to services otherwise nonexistent in the area. On a broader scale, these installations enable the FAA to point to existing locations where electric aircraft can safely land and charge—a critical first step for AAM integration into the National Airspace System (NAS).

BETA recognizes that we're charting new waters when installing electric aircraft charging on airports. We are working closely with the FAA Office of Airports to ensure installations do not face unnecessary permitting delays or regulatory barriers that will impede the electrification of transportation. BETA has encouraged the FAA to develop standard operating procedures for infrastructure installations to streamline approvals and reap the benefits for airports, communities, and businesses alike.

Government Investment in Charging Infrastructure

BETA's charging network has laid the groundwork for electric aviation adoption. However, in order to further support the industry, partnerships between industry and the government will be necessary to bring this infrastructure to scale. To that end, BETA supports measures that will assist in and accelerate the planning and deployment of AAM infrastructure. We appreciate Chairman Graves (R-LA) and Ranking Member Rick Larsen (D-WA) for their work on the Advanced Aviation Infrastructure Modernization (AAIM) Act, an important first step to securing federal support for AAM infrastructure.

Additionally, as funding from the bipartisan Infrastructure Investment and Jobs Act (IIJA) is spent to build a nationwide network of EV charging, our government cannot afford to miss this opportunity to build for the future. The United States is just now adapting our ground infrastructure to catch up to the technological innovations of the automotive industry and fully realize its benefits. As we look to the future, we are in a rare and fleeting moment where the next advances in technology are clear. We have the tools to have a broad and seamless adoption of electric aviation when the time comes; now we need to build.

To enable this, BETA is paying close attention to the IIJA's National Electric Vehicle Infrastructure (NEVI) Formula Program, where the bulk of EV infrastructure dollars are coming from. This program provides state funding to deploy EV charging infrastructure for automobiles along designated Alternate Fuel Corridors. However, this program misses the opportunity to allow states to install multimodal, on-airport charging infrastructure that supports both EV ground vehicles and aircraft. Without tapping into this unique capability, many states will miss the chance to gain additional services, like cargo and medical transport from EVs, to their communities. To this end, BETA has encouraged the U.S. Department of Transportation (DOT) to consider the economic and equity impacts of multimodal charging availability at airports in rural areas across the country.

We look forward to working with Congress to ensure that our nation can best leverage multimodal charging infrastructure by making investments in today's transportation system that will set us up for success in the future.

Leveraging Existing Infrastructure

There are more than 5,000 public airports in the United States, but more than 70% of domestic travel is conducted through less than 1% of airports¹. Electric aviation can utilize existing infrastructure at general aviation (GA) airports, which is especially helpful to reach rural communities. With its improved efficiency and affordability, this technology can help revitalize these airports. BETA's fixed-wing electric aircraft will leverage this infrastructure to provide increased access to underserved communities and bring new opportunities for job growth and economic stimulation.

¹National Aeronautics and Space Administration Report "Regional Air Mobility: Leveraging our National Investments to Energize the American Travel Experience" (2021).

However, in certain locations, BETA's eVTOL aircraft will need vertical infrastructure for takeoff and landing in certain locations. Our aviation system already has a robust network of airports and heliports that can help ensure a successful entry-into-service for eVTOLs. However, the FAA is currently working to draft design guidance for "vertiports" that eVTOLs will be required to use. To provide interim guidance for vertiport design, the FAA published Engineering Brief (EB) No. 105² in September 2022. BETA appreciates the time and resources FAA has dedicated to this effort; however, we are concerned by the limitations it places on the integration of eVTOLs into the NAS. BETA has encouraged the FAA to create a design standard that is consistent with what the industry needs and can use, while ensuring safety remains the priority. We hope that the FAA will accelerate and prioritize this in time for type certification of eVTOLs and, in the meantime, allow eVTOLs to use existing infrastructure.

IMPORTANCE OF MAINTAINING GLOBAL LEADERSHIP IN AVIATION

The United States is currently the world leader in aviation. We applaud the Administration for its efforts to support and enable AAM, recognizing that this moment provides a significant opportunity to maintain—and expand—American leadership. In recent years, AAM has attracted over \$7 billion in new investment³. This investment has given the United States a leg up to become a global leader in the electric aviation industry. Yet we are in the midst of a global race for innovative aviation technologies and many countries in Asia and Europe, through regulatory clarity, are positioned to progress more quickly, putting our leadership at risk. Developing and scaling AAM in a way that enables the United States to be first to market is critical for our economy, national security, and global leadership.

AAM Unlocks Domestic Industry

AAM provides us with a unique opportunity to foster American leadership and ingenuity with 21st century technology. BETA has created more than 500 high-paying jobs across North America since our creation five years ago, primarily in non-urban locations. As we grow and advance, we will continue to scale our business with hiring that supports a domestic supply chain, an engineering corps, and a manufacturing operation.

But AAM is more than a company or a product—it is an industry. As the domestic AAM industry reaches commercialization, it is expected to create hundreds of thousands of high-skilled manufacturing, design, and infrastructure jobs by 2040, all while placing a renewed emphasis on domestic manufacturing. This economic growth and job creation will echo through the entire supply chain.

AAM Strengthens United States' Global Competitiveness

Innovation in aviation leads to additional capabilities for our military and ensures that technologies can be developed domestically before our global competitors beat us to it. DOD has recognized this and established the Agility Prime program in 2019 to accelerate development of new technologies.

BETA has participated in the Agility Prime program since its inception. It has helped us to accelerate our path to FAA type certification, gain access to U.S. Air Force engineering expertise and test infrastructure, and evaluate use cases for military missions. The first crewed flight of an Agility Prime electric aircraft was in BETA's fixed-wing prototype in March 2022, a milestone for the program and for the AAM industry. It was another proof point that electric aviation is real and it's here.

²Federal Aviation Administration Memorandum "Engineering Brief No. 105, Vertiport Design" (2022).

³Axel Esqué and Robin Riedel, "A milestone year for future air mobility," Future of Air Mobility, McKinsey & Company, February 8, 2022. <https://www.mckinsey.com/industries/aerospace-and-defense/our-insights/future-air-mobility-blog/a-milestone-year-for-future-air-mobility>



U.S. Air Force Test Pilot Maj. Jonathan Appleby and BETA Test Pilot Camron Guthrie fly ALIA.

The investment Agility Prime has made in our industry has propelled us from developers to companies now entering production, and has given us a competitive edge globally. A report by the Department of the Air Force transmitted to Congress on August 3, 2022, titled “Report to Congressional Committees⁴,” cites the many successes of the program, including the acceleration of R&D, leverage for commercial investment, and collaboration with the FAA on aircraft certification and flight standards for operators, maintainers, and levels of autonomy.

Perhaps most notably, though, is Agility Prime’s support for a domestic AAM industry that will ensure our nation remains dominant in the race to build electric aircraft. Agility Prime’s investment in AAM so far has been a display of American leadership that will allow the AAM industry to outpace our global competitors.

UTILIZING A WHOLE-OF-GOVERNMENT APPROACH TO ENSURE SUCCESS OF AAM

The success of the AAM industry requires cooperation from all levels of government. With all relevant parties working together, AAM will be best positioned for seamless integration into our communities. BETA applauds enactment of the Advanced Air Mobility Coordination and Leadership Act (Public Law 117–203), which will ensure efforts to integrate new technologies into the aviation system are coordinated across the government. We thank Chairman Graves (R–LA) and Ranking Member Larsen (D–WA) for their leadership on this legislation, and the DOT as it works with other departments and agencies to secure continued leadership in this industry.



U.S. Secretary of Transportation sits in BETA’s ALIA aircraft at UPS WorldPort.

Important first steps have been taken, including the FAA’s establishment of the type certification basis and its work to develop a Special Federal Aviation Regulation (SFAR) for pilot training and operating rules for eVTOLs. But we still have a lot of work to do to get AAM “off the ground” here in the United States.

⁴Department of the Air Force “Report to Congressional Committees,” August 3, 2022.

Maintaining the Safest Airspace in the World

We believe that the FAA can and should ensure a predictable regulatory framework that supports innovation and global competition while maintaining safety in the national airspace as the priority. As a company of aviators, we share the FAA's goal to preserve our national standing as the safest environment in the world for aviation. That's why BETA is intensely focused on creating the safest aircraft possible.

BETA's aircraft endure full-scale piloted flight tests on an almost daily basis. The success of our flight test program has won us an FAA market survey certificate that allows us to put our products to the test in real-world flights outside of our test facility and is why the first crewed flights of an electric aircraft by Air Force and Army test pilots was in BETA's fixed-wing aircraft. In 2023, the FAA's very own test pilots also conducted a qualitative evaluation of the aircraft, following nearly a year of safety assessments.

BETA has also partnered with the National Institute for Aviation Research (NIAR), located at Wichita State University in Kansas, to conduct the industry's first FAA-sponsored drop test of a full-scale battery pack. The results of this test not only provided data to refine NIAR's simulation model for future testing for the AAM industry, but also proved that BETA's full-scale battery pack design can safely withstand the impact of a 50-foot drop, which is an important step in the certification process.



BETA partners with NIAR and FAA to conduct first-ever 50-foot drop test of full-scale battery system.

We recognize that our engineering rigor and safety orientation will keep us on target for FAA certification. Moreover, we believe this paves the way for the rest of our industry's success as electric aircraft developers go down the same path. As such, a clear pathway to certification is needed to not only support innovation, but help maintain the safest airspace in the world.

Committing the Necessary Resources and Staffing

As aviation enters a new era, the FAA is experiencing an influx of applications from new entrants who are introducing new and novel technologies and systems to the FAA. BETA recognizes this and has chosen to take a stepwise approach to the certification process, beginning with our electric motor, then our fixed-wing airplane, and ultimately our vertical takeoff aircraft. Because electric aviation has strict energy and power-density requirements for flight, it brings a new and unique set of requirements for the FAA to consider for certification, including high energy-density batteries, high torque-density electric motors, distributed electric propulsion systems, and fly-by-wire flight controls. Because the FAA has never certified electric propulsion for commercial use, a body of specialized subject matter experts (SMEs) that understand the technology is necessary to advance type certification applications.

Further, as the FAA determines the airworthiness criteria to establish the level of safety performance for AAM aircraft, coordination, collaboration, and communication across its teams is paramount. This requires additional staff in FAA's policy and certification offices and on the teams responsible for implementing airworthiness criteria. We encourage the FAA to hire and train additional technical experts who will keep pace with advancements in technology and support new entrants' certifications and operations in the NAS.

CONCLUSION

Our nation is on the cusp of a new era of flight, and BETA is eager to bring the economic, healthcare, and environmental benefits of AAM to communities across the United States. This year's FAA Reauthorization comes at a critical time, giving Congress the chance to provide the additional direction to the FAA that will get electric aircraft certified and into the airspace in a safe, reliable way. The following items require swift progress in order to bring AAM to fruition in the United States:

- Continued progress toward the type certifications of the aircraft, including adequate staffing and appropriate technical resources for AAM;
- Transparency and certainty in the regulatory process, including timely promulgation of an SFAR that ensures the broadest pool of eligible pilots;
- Common infrastructure that enables accessible and efficient charging for all AAM aircraft; and,
- Global harmonization among international aviation authorities to allow AAM to scale at a global level.

If the United States can make progress on these key issues, our AAM industry will be positioned to deliver benefits of this innovation to your diverse communities across the country. BETA appreciates the Subcommittee's leadership and willingness to engage with industry, and for the opportunity to testify. We look forward to working with you to ensure that the United States remains the leader in aviation for decades to come.

Mr. YAKYM. Thank you, Mr. Clark.

Mr. Bevirt, it is good to see you again, sir. Welcome. I now recognize you for 5 minutes of testimony.

**TESTIMONY OF JOEBEN BEVIRT, FOUNDER AND CHIEF
EXECUTIVE OFFICER, JOBY AVIATION**

Mr. BEVIRT. Thank you so much. I really appreciate the opportunity to come and speak with all of you. And I really appreciate your leadership in this pivotal year as we look to FAA reauthorization.

My name is JoeBen, and I am the founder and CEO of a company called Joby Aviation. Like BETA, we are building electric aircraft and electric vertical takeoff and landing aircraft.

We are at a defining moment in aviation. And this is the first propulsion revolution that we have seen since the dawn of the Jet Age. And I am proud to say the team at Joby has been hard at work leading the charge in developing these really important new technologies.

We spent more than a decade developing, testing, and flying these aircraft. And we believe this will change the way people move, both in rural communities and in urban communities around the world and introduce millions of people to the freedom of flight and bring emissions-free and quiet aviation into reality.

Today, we are beginning to ramp up our manufacturing efforts. And we are starting that with our pilot manufacturing facility in Marina, California. And in the next few months, we are going to be selecting a site for our phase 1 manufacturing facility, which will give us the ability to ramp up to hundreds of aircraft per year.

And we have made great progress in certifying our aircraft in partnership with the FAA. The best and the brightest in the agency have put tens of thousands of hours into defining, documenting, and executing on the certification path tailored to our aircraft. We have already begun to execute the tests and analyses necessary to prove our aircraft meets those safety standards. And it is critical that the FAA stays steadfast in that path, as Kyle talked about.

This new era of electric aviation, it is here today. And it is imperative that we stay steadfast in our focus, the FAA's focus. And for American companies, it is imperative that Congress is consistent. As you look to draft this year's FAA reauthorization bill, I ask that you please consider the following themes.

First, it is vital that the FAA continue to provide a reliable environment for companies commercializing next-generation aviation technology like Joby. We must progress on the current, well-defined type certification path for pilot eVTOL aircraft.

Second, the FAA must publish a timely Special Federal Aviation Regulation, or SFAR, to guide our day-to-day operations. The agency is committed to delivering this by December 31, 2024. And while we are pleased to hear that they are a month ahead of schedule, we need Congress to ensure that the SFAR is completed on time as well as create an interim policy to enable commercial operations if that process stalls.

Third, we ask that you confirm eVTOL aircraft can use the thousands of existing public airports and heliports as they are designed to do. Our national aviation heritage is anchored in a mix of public and private infrastructure, totaling nearly 20,000 airports and heliports. New innovation in flight can revitalize much of this infrastructure, presenting new opportunities for mobility in both rural and urban communities.

And finally, the next era of aviation will require a robust workforce, including skilled manufacturing technicians, aircraft maintainers, pilots, and ground staff. We are doing our part to lower the barriers of entry to introduce a wider group of people to careers in aviation. At our facility in Marina, we are hiring Salinas Valley locals for apprenticeship programs that include paid on-the-job training and nationally recognized aerospace certifications. In New York City, we are partnering with Aviation Career and Technical Education High School to develop curricula on electric aircraft for the next generation of maintainers.

We ask for your support through rigorous and equitable workforce development programs that leverage modern technology and bring more bright minds to careers in our industry. Likewise, we ask that you ensure the FAA has the workforce it needs to keep up with the development of revolutionary technology here in America.

American leadership requires a strong, bold, and collaborative FAA that maintains consistency in its policymaking and fosters an environment where companies like Joby can bring the next generation of aviation to the world in the cleanest, safest, and most inclusive way possible.

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

[Mr. Bevirt's prepared statement follows:]

Prepared Statement of JoeBen Bevirt, Founder and Chief Executive Officer, Joby Aviation

INTRODUCTION

Good morning Chairman Graves, Ranking Member Cohen, and distinguished members of the House Transportation and Infrastructure Committee Subcommittee on Aviation.

My name is JoeBen Bevirt, and I am the Founder and CEO of Joby Aviation, a California-based company leading the charge in the emerging industry of advanced air mobility (AAM).

Since 2018, I have served as a member of the Board of Directors and the Executive Committee for the General Aviation Manufacturers Association (GAMA). Currently, I serve as the Chair of GAMA's Electric Propulsion and Innovation Committee (EPIC), where companies involved in AAM develop consensus to create an environment that supports the efficient design, production, operation and maintenance of electric vertical take-off and landing aircraft, or eVTOLs. Additionally, Joby is a member of the National Business Aviation Association's 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.

At Joby Aviation, we are proud to be at the forefront of the era of electric aviation. Our primary focus is the development and certification of our piloted, all-electric aircraft, designed to transport up to four passengers at speeds of up to 200 mph, with zero operating emissions and low noise, which we intend to operate as part of an aerial ridesharing service.

To ensure the success of AAM, I encourage the Committee to consider two key themes. First, confirm the Federal Aviation Administration (FAA) remains focused on the implementation of straightforward policies companies can utilize on their first day of operations. For piloted aircraft like Joby, this means utilizing the existing system to the fullest extent practical; these aircraft are designed to work with existing airports, existing heliports and today's air traffic control system.

The second is to maintain the United States' position as the global leader in aviation. This requires strong regulatory and policy leadership from the Department of Transportation (DOT) and the Federal Aviation Administration (FAA). The country must maintain the FAA path developed over the last decade, then take lessons from initial operations to make the aviation system even more vibrant. Success, in many ways, will come from the priorities you set in this year's FAA reauthorization bill and in your oversight of the agencies and regulators.

As this Committee considers definitions for AAM in the FAA reauthorization bill, we suggest it to be defined as *the next generation of inhabited aircraft with advanced automation, electric propulsion and/or low noise signature that are intended to open new opportunities for air transportation*. We believe this definition supports a broad portfolio of technologies for the limited purpose of policy development.

THE FAA'S PATH

The FAA spent the last decade working across applicants, researchers and standards bodies to create a thorough and well-designed path for the design, certification, and operations of electric aircraft that builds on the remarkable safety learnings from decades of traditional aircraft certification projects. As the global eVTOL market continues to expand, standing behind these key policies along with consistent and reliable decision-making by the FAA will be crucial in ensuring that the U.S. aviation industry continues to thrive.

At Joby, we applied for type certification with the FAA in 2018 and since that time, thousands of key decisions have been documented across the program. Joby is quickly moving into the implementation phase of certification, and now has the majority of our area-specific certification plans approved by the FAA. These plans cover crucial aspects of Joby's aircraft design, performance, and safety features, demonstrating our commitment to meeting or exceeding regulatory requirements. By working closely with the FAA, Joby has ensured that the novel technologies included in our aircraft design align with the necessary airworthiness criteria and safety standards.

Our regular engagement with the FAA is built on the transparent and collaborative relationship established over the last five years of our certification program. As we move from policy development into oversight execution, it is important for FAA certification resources to be available to review test plans, witness testing and accept final reports.

Continued U.S. leadership in both technology development and regulatory definition requires minimizing unnecessary changes that delay progress. Consistent decision-making by the FAA is vital not only for the successful certification and integration of eVTOL aircraft into the National Airspace System (NAS), but also to ensure the competitiveness of the American aerospace industry in the global market. Maintaining a stable and predictable regulatory environment is key to securing America's leading position in the next era of aviation technologies.

Foreign regulators in China and Europe are working to form their own regulations for electric aviation. If the FAA fails to maintain its leadership position, other countries will dictate how future aircraft are manufactured and operated, putting American companies at a disadvantage in the global market.

Following the FAA decision to regulate eVTOL aircraft as powered lift, the agency needs to provide operating rules for this class of aircraft. These rules will be issued through Special Federal Aviation Regulations (SFAR), which the FAA has committed to delivering by December 31, 2024.

We were pleased to hear that the agency's proposed SFAR has been forwarded from FAA to DOT one month ahead of schedule, but there is more to be done. We hope Congress will partner with us to ensure the process is completed on time, as well as create an interim policy to enable early commercial operations if the rule-making process misses this deadline or a company achieves type certification prior to rule completion.

A LONG-TERM SOLUTION FOR THE FUTURE OF VERTICAL AVIATION INFRASTRUCTURE

Joby appreciates the leadership of Chairman Garret Graves, Ranking Member Rick Larsen and Ranking Member Dina Titus for ensuring passage in the FY 2023 Omnibus of the Advanced Aviation Infrastructure Modernization Act (AAIM Act), authorization for planning grants to facilitate the investment in Advanced Air Mobility infrastructure. An investment in community planning is an important step when thinking about infrastructure, especially in considering how to maximize the infrastructure that already exists.

Our national aviation heritage is anchored in infrastructure. Thanks to decades of investment, the U.S. is home to nearly 13,000 airports and 6,000 heliports. This system, which is a mix of both public and private infrastructure, has enabled our aviation industry to flourish over the past 50 years. AAM will present new mobility options for people in rural and urban communities and help revitalize much of this infrastructure.

For the long-term success of the aviation industry, it is critical that eVTOL aircraft can operate out of all forms of aviation infrastructure—including airports and heliports—as well as permit new sites to support industry growth. If eVTOL is unable to use existing aviation infrastructure, it will drastically impact our nation's ability to lead in the future of flight since it will require all new infrastructure to be permitted for operations to begin.

We must have a clear pathway to day-one operations for existing infrastructure. While we are pleased with the FAA's Office of Airports' proactive approach to new entrants, a lack of clear direction and guidance at the federal level, with respect to existing heliports and airports, has resulted in confusion and ambiguity at the state and local level. Our eVTOL aircraft, like most others undergoing type certification, has been designed to use existing heliports and airports on day one.

We would encourage Congress to establish a definition in U.S. Code for heliports that indicates they are used or intended to be used by any aircraft capable of vertical takeoff and landing. We believe that existing frameworks for heliport design, planning, permitting and approval are suitable both for heliports and future vertiports. As we look to the future, we see vertiports as a type of heliport that can meet community needs through appropriate noise standards and limitations.¹

WORKFORCE DEVELOPMENT

We often focus on the transportation benefits made possible by AAM, but the revolution in electric propulsion has widespread economic benefits, including clean technology jobs in manufacturing and operations. AAM is estimated to add nearly \$1 trillion and 400,000 jobs² to the economies around the world that invest in it. At Joby, we are committed to playing our part in driving this economic driver and creating a more sustainable and efficient transportation system for all.

¹ See, <https://transportation.house.gov/calendar/eventsingle.aspx?EventID=405816>

² See, https://panetta.house.gov/sites/panetta.house.gov/files/documents/2023.02.23_DOT_AAM%20Leadership%20Letter.pdf

The industry will need to grow its workforce, including skilled manufacturing technicians, aircraft maintainers, new pilots, and new ground staff. We're doing our part to cultivate a vibrant and diverse workforce.

For example, we're partnering with Aviation Career & Technical Education High School in New York City—a unique high school offering rigorous instruction and equitable access to aviation curricula followed by steady work as aircraft maintainers.

In Marina, we're working with Monterey Bay Drone, Automation and Robotics Technology (DART) Initiative and the James Irvine Foundation to establish apprenticeship programs that include paid on-the-job training for Salinas Valley locals interested in upskilling.

We're laying the groundwork for a pilot academy that will radically reduce the economic cost of becoming a commercial pilot and lower the barrier to entry.

As this Committee considers FAA Reauthorization, we kindly request policies that broaden access to aviation careers, such as the expansion of the Aviation Workforce Development Grant, decrease the cost of flight training, fund apprenticeship programs, and explore new technologies, such as the use of virtual reality for flight training.

ENSURING MATURATION OF INDUSTRY AFTER COMMERCIALIZATION

We are grateful to Chairman Garrett Graves, Congresswoman Sharice Davids, and members of the Committee for introducing and passing the “Advanced Air Mobility (AAM) Coordination and Leadership Act,” which created an interagency working group intended to coordinate efforts “necessary for [the] maturation of the AAM ecosystem in the United States, particularly passenger-carrying aircraft.”

We support the interagency working group's efforts, as codified, to “grow new transportation options; amplify economic activity and jobs; advance environmental sustainability and new technologies; and support emergency preparedness and competitiveness³.” Collaboration and information-sharing among the members of the interagency working group is crucial to long-term maturation of eVTOLs, as regulatory, policy and infrastructure decisions made today can support the future growth and development of the AAM ecosystem.

We hope the working group will expand upon the strong foundation of U.S. government leadership on AAM technology and commercialization displayed by NASA, through its ongoing research with industry partners into acoustics, airspace modernization, and aircraft operations; and the Department of Defense's Agility Prime program, which has actively invested in emerging aviation technology development for many years.

CONCLUSION

This is a defining moment for aviation—the first propulsion revolution the world has seen since the dawn of the Jet Age, with the potential to bring people and goods closer together than ever before, in both rural and urban communities. As cleaner and quieter aircraft are introduced into the market, it is imperative that the United States continue to set the global standard for aviation safety while championing the industry's transition to climate-neutral methods of flight.

I thank you for your time, your passion, and your leadership.

Mr. YAKYM. Thank you, Mr. Bevirt.

The Chair now recognizes Mr. Christopher Bradshaw for 5 minutes of testimony.

TESTIMONY OF CHRISTOPHER BRADSHAW, PRESIDENT AND CHIEF EXECUTIVE OFFICER, BRISTOW GROUP INC., ON BEHALF OF THE HELICOPTER ASSOCIATION INTERNATIONAL

Mr. BRADSHAW. Mr. Chairman, Ranking Member Cohen, and members of the committee, thank you for having me here today.

My name is Chris Bradshaw, and I am the president and CEO of Bristow Group. It is my pleasure to be here today on behalf of our trade association, Helicopter Association International.

³See, <https://www.congress.gov/bill/117th-congress/senate-bill/516/text>

As the global leader in innovative and sustainable vertical flight solutions, Bristow makes the world a safer and more productive place by delivering safe, efficient, and reliable aviation solutions around the globe.

I am here to talk about our organization and the pragmatic approach we are taking as an experienced vertical lift operator entering the field of advanced air mobility, or AAM. First, though, I would like to take a moment to talk about safety, which is Bristow's number-one core value and our highest operational priority.

This is evidenced by the long-running success of our Target Zero safety culture and safety-focused approach in all that we do. New technology is revolutionary, but safety and operational excellence are evolutionary. In the case of Bristow, our safety culture and safety management system have evolved and matured over 75 years since the founding of the company in Alaska in 1948.

Headquartered in Houston, Texas, Bristow employs more than 3,000 people, and has a presence on 6 continents with aircraft in 17 different countries. Here in the U.S., our main bases of operation are in south Louisiana where we provide personnel transportation and search-and-rescue services to our commercial clients and the U.S. Government throughout the Gulf of Mexico.

In addition to our offshore energy services business, we provide dedicated search-and-rescue services to sovereign nations, including the United Kingdom, the Netherlands, and elsewhere.

Today, I want to talk about AAM and how Bristow fits into that emerging landscape. We believe AAM will play an important part in the future of aviation. These new technologies have the potential to make certain missions more efficient, quieter, more accessible, and more sustainable. Indeed, we believe AAM represents a powerful opportunity to accelerate sustainability within our industry.

We view AAM as a natural extension of Bristow's core competencies, and we see multiple avenues for Bristow to participate in the emerging value chain. We think AAM will first serve the cargo and logistics needs of our existing customers with personnel transport coming later.

Bristow believes an incremental approach to adoption—think crawl, walk, run—is best. We also see various opportunities to expand vertical flight services into entirely new markets, including regional air mobility and eventually more urban air mobility missions as well.

Bristow has strategically partnered with multiple leading AAM equipment manufacturers that are developing aircraft targeted to fulfill different mission profiles. At the core of these partnerships, Bristow intends to lend critical safety, operational, certification, and logistics expertise to help guide the launch of these new solutions.

It is very exciting to be sitting here next to Kyle Clark of BETA Technologies. We intend to purchase up to 50 of their eVTOL and/or eCTOL aircraft, and we look forward to providing personnel transport and logistic services, utilizing these aircraft once they are certified.

With all of this potential, we need the FAA's support. Bristow has a good working relationship with the FAA, and we are grateful

for the work they do day in and day out to oversee the safe and proper functioning of our industry. As it relates to AAM and the introduction of new technologies, though, we fear the U.S. regulatory framework lags in comparison to that of other global jurisdictions.

We know that the FAA's number-one priority is safety. That is our number-one priority as well. Yet, opaque processes and shifting timelines are less than ideal. Additional clarity and expediency from the FAA are required to support U.S. leadership in a competitive global marketplace.

Additionally, there is a need to attract and develop the next generation of the aviation workforce that will be required to pilot and maintain these aircraft. We are asking, with Congress' help, that the FAA adopt the ICAO guidance that provides a logical and pragmatic approach to operating powered-lift aircraft in the national airspace and would help to address the anticipated AAM workforce shortage as the new technology enters operation.

We also support the expansion of the workforce development grant that was begun in the last FAA reauthorization. Specifically, we would like to see rotorcraft included in the eligible pool of these critically important grants.

At Bristow, we are very excited to be lending our expertise as a mature and proven operator of vertical lift aircraft to drive innovation with our partners in the AAM space. AAM and these next-generation propulsion systems and technologies are essential to the longstanding sustainable growth in the vertical flight industry.

It is my privilege to be here today, and I look forward to answering your questions. Thank you.

[Mr. Bradshaw's prepared statement follows:]

Prepared Statement of Christopher Bradshaw, President and Chief Executive Officer, Bristow Group Inc., on behalf of the Helicopter Association International

Chairman Graves, Ranking Member Cohen, and Members of the Committee, thank you for having me here today. My name is Chris Bradshaw, and I am the President and CEO of Bristow Group. It is my pleasure to be here on behalf of our trade association, Helicopter Association International (HAI). As the global leader in innovative and sustainable vertical flight solutions, Bristow makes the world a safer and more productive place by delivering safe, efficient and reliable aviation solutions around the globe. I am here today to talk about our organization and the pragmatic approach we are taking as an experienced vertical lift operator entering the field of advanced air mobility—or AAM.

First, though, I would like to take a moment to talk about safety, which is Bristow's #1 core value and our highest operational priority. At Bristow, we each own safety, every day. This is evidenced by the long-running success of our Target Zero safety culture and safety-focused approach in all that we do. Safety drives our business, and it will continue to be our North Star as we expand our service offerings to existing customers and enter new markets operating the next generation in aviation technologies. New technology is revolutionary, but safety and operational excellence are evolutionary. In the case of Bristow, our safety culture and safety management system have evolved and matured over 75 years, since the founding of the Company in Alaska in 1948.

Headquartered in Houston, TX, and publicly traded on the NYSE, Bristow employs more than 3,000 people and has a presence on six continents, with customers in 17 countries. Here in the U.S., our main bases of operations are in South Louisiana, where we provide personnel transportation and search and rescue services to our commercial clients and the U.S. government throughout the Gulf of Mexico. In addition to our offshore energy services business, we provide dedicated search

and rescue services to sovereign nations, including the United Kingdom, the Netherlands, the Dutch Caribbean region and elsewhere. Recently, we were proud to fly the NATO Secretary General, the Norwegian Prime Minister, the European Commission President and the CEO of Equinor to and from an offshore platform in the North Sea. We are honored by the faith our customers place in us, and we are committed to earning that trust anew every day.

Today, I want to talk about AAM and how Bristow fits into that emerging landscape. We believe AAM will play an important part in the future of aviation. These new technologies have the potential to make certain missions more efficient, quieter, more accessible, and more sustainable. Indeed, we believe AAM represents a powerful opportunity to accelerate sustainability within our industry. We view AAM as a natural extension of Bristow's core competencies of safe, efficient and reliable vertical flight solutions, and we see multiple avenues for Bristow to participate in the emerging AAM value chain. One of those avenues will be servicing our existing customers in a broader way. As we expand our services, we will do so prudently and safely, as we always have. We think AAM will first serve the cargo and logistics needs of our customers, with personnel transport coming later. Bristow believes an incremental approach to AAM adoption (think "crawl, walk, run") is best. We also see various opportunities to expand vertical flight services into entirely new markets including regional air mobility and eventually more urban air mobility operations as well.

One size does not fit all. Bristow has strategically partnered with multiple leading AAM equipment manufacturers that are developing aircraft targeted to fulfill different mission profiles.

Bristow's Public Strategic AAM Partners

- Bristow has collaborations with multiple leading AAM manufacturers to provide critical safety, operational, certification, and logistics expertise to guide the launch of these new solutions.
- Bristow recognizes the benefits of a varied fleet, and we intend to diversify our fleet and service offerings by utilizing multiple AAM aircraft to build robust network capabilities and support various end markets.



At the core of these partnerships, Bristow intends to lend critical safety, operational, certification and logistics expertise to guide the launch of these new solutions. It is very exciting to be sitting next to Kyle Clark of BETA Technologies. We intend to purchase up to 50 of their eVTOL and / or eCTOL aircraft in the near future, and we look forward to providing personnel transport and logistics services utilizing these aircraft once they are certified.

With all this potential, we need the FAA's support. Bristow has a good working relationship with the FAA, and we are grateful for the great work they do day-in and day-out to oversee the safe and proper functioning of our industry. As it relates to AAM and the introduction of new technologies though, we fear the U.S. regulatory framework lags in comparison to that of other global jurisdictions. We know that the FAA's #1 priority is safety. That is our #1 priority as well. Yet, opaque processes and shifting timelines are less than ideal. Additional clarity and expediency from the FAA are required to support U.S. leadership in a competitive global marketplace. Additionally, there is a need to attract and develop the next generation of the aviation workforce that will be required to pilot and maintain these aircraft. We are asking—with Congress's help—that the FAA adopt the recommendations included in ICAO Document 10103 "Guidance on the Implementation of ICAO Standards and Recommended Practices for Tilt-rotors." This document provides a logical and pragmatic approach to operating powered lift aircraft in the National Airspace and would help to address the anticipated AAM workforce shortage as the new tech-

nology enters operation. We also support the expansion of the Workforce Development Grant program that was begun in the last FAA Reauthorization. Specifically, we would like to see rotorcraft included in the eligible pool of these critically important grants.

At Bristow, we are excited to be lending our expertise as a mature and proven operator of vertical lift aircraft to drive innovation with our partners in the AAM space. We look forward to the opportunities it will bring to provide efficient and sustainable flight solutions to our customers. AAM and these next generation propulsion systems and technologies are essential to the long-term sustainable growth in the vertical flight industry.

It is my privilege to be here today, and I look forward to answering your questions. Thank you.

APPENDIX

HELICOPTER ASSOCIATION INTERNATIONAL (HAI)
ADVANCED AIR MOBILITY INDUSTRY ADVISORY COUNCIL (AAM-IAC)
ROADMAP OF ADVANCED AIR MOBILITY OPERATIONS 2023
SUMMARY OF PRIORITIES

INFRASTRUCTURE

Near-Term

- The existing system of airports and heliports should be leveraged to support initial operations when and where possible, while planning for and beginning to deploy new infrastructure. The industry should continue engaging with airport/heliport managers, FSDOs, ADOs, state DOTs, airport associations, ATC, local governments, metropolitan planning organizations, and others.
- Both public and private infrastructure should comprise the AAM network to enable the industry to begin initial operations quickly and to scale effectively.
- Charging stations will be required to support early operations. The industry would benefit from a better understanding of charging requirements, supporting electrical infrastructure, and any potential limitations that would affect initial AAM operations. Standards, guidance, and policies for installing AAM charging infrastructure need to be developed.

Mid-Term

- The industry will need to start developing and understanding, in concert with the power industry, the necessary grid structures to support AAM. Standards, guidance, and policies for installing AAM charging infrastructure need to be developed and planned accordingly. We recommend an in-depth, joint (including aircraft manufacturers, operators, infrastructure companies, electric utility companies, electricity regulatory bodies, and localities) study on the electricity demand for each type of vertiport, including the number of stands and electric charging stations. Additionally, methods to ensure that all types of AAM vehicles will be able to utilize any charging station, such as universal charging ports, should continue to be developed.
- The industry should communicate and engage with international manufacturers, regulators, authorities, and operators to prioritize global harmonization, where appropriate. While the United States is gearing toward AAM support and activities, other nations are equally seeking to materialize a robust AAM ecosystem.
- The industry can use digital twins of cities to support data-driven decision making related to infrastructure planning, zoning, route optimization, and asset management. These tools will be critical for cost avoidance, identification of second-order impacts, and enhanced productivity. Further, digital twins can help policymakers and the public visualize the impact of AAM on their communities.

Far-Term

- Communication capabilities such as vehicle-to-vehicle (V2V) and vehicle-to-ground (V2G) are vital elements of AAM operations and will need substantial support and facilitation to scale for a dense AAM ecosystem.
- New infrastructure such as vertiports will require the combined efforts of industry and regulators to facilitate the entry of new markets and operations (both VFR and IFR) into the AAM ecosystem.

REGULATIONS AND AIRSPACE USE

Near-Term

- Regulations must facilitate a smooth transition from existing ground infrastructure to new infrastructure or a combination of both.
- The industry should continue to build partnerships with stakeholder authorities (e.g., EASA, ICAO, FAA, NASA) and other interested parties for airspace development for AAM operations. The FAA airworthiness regulations 14 CFR Part 23, 27, and 29 can be utilized to support AAM aircraft certification activities. However, the use of eVTOL in Part 135 commercial operations requires additional clarity and adaptation due to the unique operational characteristics. The FAA's recent notice of proposed rulemaking (NPRM) to incorporate powered lift (eVTOL) aircraft into its regulatory definitions covering air carriers (Docket No. FAA-2022-1563; Notice No. 23-03) is a necessary first step, but the FAA must also define the aircrew and operating rules.
- Current regulations restrict existing infrastructure such as heliports due to the rigidity of the language. There is a considerable portion of existing infrastructure that is not covered by current regulations that could be leveraged for initial AAM operations.
- AAM operations will benefit greatly from direct routing due to power limitations. In a dense AAM ecosystem with numerous operations requiring specific routes, the industry will need to create far-term routing solutions harmonized with all AAM capabilities. Routing procedures should consider all operational areas (urban, rural, mixed) and differentiate between high-density and low-density flight areas. Integration of the airspace, rather than segregation of operations, should be the goal.

Mid-Term

- Airspace regulations for AAM operations must be flexible and performance based. As current IFR rules may not be sufficient, a hybrid set of flight rules, i.e., Digital Flight Rules (DFR), to accompany VFR and IFR operations may be more beneficial to AAM.
- AAM could initially leverage existing routing procedures, such as low-altitude helicopter routing, but this may not be adequate as operations scale. Aircraft-generated sound should be considered when developing routing, especially within populated areas such as cities, and attention will need to be placed on community equity.

Far-Term

- While legacy regulations related to reserve requirements may be adequate for some operators, energy reserve requirements must capture the scope of all operators and types of operations, whether fixed-wing, rotary-wing, or a hybrid of both. Destination intentions, weather considerations, unique airport operations, local geography, and population density will all play a role in determining energy reserve requirements (e.g., landing as a fixed wing at an airport, or as a rotary wing at a pad).
- PSUs could increasingly become a vital part of traffic management in AAM and may be the primary driver of avoiding conflict with other flight operators in the same airspace.

DESIGN AND CERTIFICATION

Near-Term

- The AAM community may utilize existing maintenance training standards for initial operations until exemptions or alternate means of compliance are in place. Operators will pull from the existing CPL(A), CPL(H), or CPL(PL) communities with pilots undergoing transition training.
- Aircraft OEMs and regulators should align efforts to address the unique certification requirements of AAM aircraft designs. It would be a mistake to try to fit these aircraft into helicopter or airplane type certification standards. Aircraft performance capabilities are among the driving factors in aircraft type certification.
- Insurance coverage will be required for addressing AAM's unique risk exposures. Industry and partners should begin discussions with the insurance industry to identify risk assessment and mitigation for AAM operations.
- Maintenance requirements must be addressed to enable early entry into commercial operations. Industry OEMs should determine the required maintenance for these unique aircraft and work with regulators to develop policy for maintenance providers.

Mid-Term

- As operations scale, maintenance requirements and standards may need re-vamping to accommodate the AAM systems and technologies.
- As various models of AAM aircraft are introduced, considerations such as size of aircraft, type of operations, pilot training, qualifications, and certifications will influence specific insurance requirements.
- Workforce training will need to support various components of the entire AAM ecosystem, including pilots, mechanics, traffic management, and engineers. Complexities of the varied types of AAM aircraft may lead to the need for a pilot type rating for each unique aircraft design.
- Autonomy certification processes, standards, and incorporation for scaling and safety need to be developed. The pilot qualifications for remotely operated or autonomous aircraft should be reviewed; the current commercial pilot shortage will be exacerbated if we do not take the opportunity to review the appropriate skills needed for operations that will not include a pilot on board.

Far-Term

- Pilot and technician ab initio pathways need to be created to address the looming workforce shortage.
- Within a high-density AAM ecosystem, there will be a significant number of flights per day, requiring different and unique or new types of maintenance. There may be the need for on-site and off-site maintenance teams at vertiports for emergency repairs and/or extensive vehicle repairs, respectively.
- There is a need to create a new workforce pipeline for pilots, remote pilots, supervisors, mechanics, and additional ground or aircrew personnel. This pipeline should be tailored to this new technology rather than forcing workers into the existing pipelines for pilots and mechanics, where a majority of what they learn and get trained to do will not be applicable to eVTOL. Tailoring the development of the AAM workforce to AAM requirements could create a more efficient workforce pipeline.

AAM ENTERPRISE

Near-Term

- Community outreach campaigns will be critical to the success of AAM. The industry must educate and influence the public, policymakers, and non-AAM industry stakeholders, as well as pursue efforts to align the various government agencies.
- For the rotorcraft industry, eVTOL aircraft will simply represent the addition of a new aircraft to their fleets, thus, current operators have the full scope of vertical lift missions, including safety and regulatory backgrounds.
- Workforce remains an issue for initial operations, and the industry will need to focus on building the workforce pipeline to support future operations. There is utility in the outreach to other rotorcraft/drone pilots and operators to raise an initial workforce for early AAM operations.
- Supporting programs can demonstrate the effectiveness of AAM, including demonstration operations and ConOps testing.
- Support programs must be developed to address member and public engagement on the full scope of support and service-related issues for AAM including fire codes (National Fire Protection Association).

Mid-Term

- There is a need to establish community talking points focused on the importance of AAM to the aviation industry and communities. Changes in state and municipal codes for AAM could be expected to take five years or more and will depend on the acceptance and support of communities.
- Industry must monitor community reaction to the effects of aircraft generated sound and promote the low sound profiles of AAM aircraft through demonstrations and use cases to continue to build momentum for community acceptance.

Far-Term

- As the AAM industry scales, community engagement must also scale, with continued education and outreach. The success of initial piloted AAM operations will provide the public confidence in both the safety and benefits as increasing levels of autonomy are incorporated and introduced.

Mr. YAKYM. Thank you, Mr. Bradshaw.

Next, the Chair recognizes Mr. Clint Harper for 5 minutes of opening testimony.

**TESTIMONY OF CLINT HARPER, ADVANCED AIR MOBILITY
EXPERT AND COMMUNITY ADVOCATE**

Mr. HARPER. Thank you.

I would like to start off today by acknowledging the indigenous peoples whose ancestral homelands we are gathering on today, as well as those who are living here today who struggle to have their voices heard.

Good afternoon, Chairman Graves, Ranking Member Larsen, Ranking Member Cohen, and members of the subcommittee. I am honored to be here today with my esteemed colleagues.

For this testimony, I will draw upon my experiences in working with State and local governments to achieve their advanced air mobility goals. I am not here to represent the views of any single jurisdiction. Instead, these insights are a compilation of my observations while helping governments. My hope is that the lessons that I have learned can be incorporated into the upcoming FAA reauthorization bill.

As we approach an exciting new era in aviation, we must recognize a sobering truth: Regrettably, today, the majority of aviation benefits are enjoyed by those with higher disposable incomes, while, on the other hand, negative externalities, such as noise and emissions, are disproportionately endured by those struggling to make ends meet.

We must make it our duty as a Nation to confront this disparity and champion a more equitable and inclusive aviation future for all citizens. I believe that advanced air mobility represents a significant step in the right direction if integrated into communities thoughtfully.

Equity must be at the forefront of our pursuit. Our collective effort should aim to forge a future in which the burdens and benefits of aviation are allocated in a more equitable manner. In doing so, we can ensure that AAM's promise of progress is truly shared by all.

As we navigate the intricate challenges of integrating new mobility technologies into our landscapes, city staff must remain focused on the complex and immediate pressing issues of today. This often leaves little time to contemplate emerging technologies that have yet to fully materialize.

Nevertheless, we must not overlook the potential of integrating advanced air mobility into our transportation system, as it offers us a rare chance to demonstrate what we have learned from previous missteps in transportation-related decisionmaking, where decisions favored the quality of life for the privileged at the expense of the marginalized.

To address this, the reauthorization bill should provide funds and resources for communities to advance the holistic integration of advanced air mobility technologies. This aid will help communities identify where advanced air mobility interventions can provide solutions where the legacy transportation system currently struggles. This includes promoting the development of strategic

plans, digital infrastructure tools, multimodal integration, job creation, and more.

In my nearly 6 years of collaborating with State and local governments, it has become increasingly clear that city land-use and transportation planners hold the keys to the successful integration of advanced air mobility technologies. However, traditional university planning programs often neglect aviation topics. This oversight complicates collaboration and hinders the seamless incorporation of aviation into broader transportation solutions.

If we continue to isolate aviation from other modes, we risk undermining our efforts to offer citizens the transportation choices that best meet their needs. Therefore, it is crucial that the reauthorization bill encourages educational programs and resources that raise awareness of aviation among traditional planning professionals. By cultivating an understanding of aviation's role in the broader transportation system, we can work together to build a better and more interconnected future.

We must also recognize that we are not fully utilizing the vast talent available to us. To tap into our collective potential, we must promote diversity and inclusivity.

With this belief, I encourage that the reauthorization bill includes provisions to foster a diverse aviation workforce, provides training and education programs for transitioning veterans, and incentivizes private companies and organizations to support the recruitment of diverse talents. Through these united efforts, we can ensure that our Nation's skies are supported and navigated by the most skilled and capable workforce.

As AAM operations draw closer, it is vital to ensure that our current vertical lift infrastructure provides a foundation for eVTOLs and supports the increased tempo of operations, particularly in dense urban environments.

Current infrastructure is inadequate. Many heliports are plagued by obstructions, lack of proper weather reporting as well as current tools for risk identification, mitigation, and communication. We must enhance our infrastructure to ensure growth and progress.

The reauthorization bill should incorporate measures that assist States and cities in better regulating and managing their urban and rural aviation systems. A reinvigorated system should stimulate competition, choice, and innovation through a blend of public and private infrastructure that embodies safety, accessibility, and promotes multimodal options, especially transit and active transportation.

We stand at a crucial point in our transportation history. Our decisions can serve to correct past mistakes that continue to marginalize struggling communities today. This is an opportunity for all transportation sectors to unite and build a better system.

Thank you all for this opportunity. I eagerly anticipate partnering with you to pioneer a new era in aviation and transportation.

Thank you.

[Mr. Harper's prepared statement follows:]

**Prepared Statement of Clint Harper, Advanced Air Mobility Expert and
Community Advocate**

Chairman S. Graves, Chairman G. Graves, Ranking Member Larsen, Ranking Member Cohen, and Members of Congress—my name is Clint Harper. I am an Advanced Air Mobility (AAM) subject matter expert and community advocate. I am honored to appear before you and this Committee to discuss my experiences and takeaways from working with state and local governments and assisting them with their Advanced Air Mobility (AAM) integration goals in hopes that lessons learned may be captured in the upcoming Federal Aviation Administration's (FAA) Reauthorization Bill. But first, I would like to establish the context that shapes my understanding of AAM and its role in a city's transportation system.

My aviation career started 24 years ago in the United States Air Force. I first enlisted as a communication, navigation, and sensor technician on the AC-130H Spectre Gunships. This highly specialized airframe exposed me to various aircraft avionics and sensor systems. In addition, it taught me how these aircraft systems work together to enable safe passage through our National Airspace System (NAS) and in complex contingency environments. In 2004, I was eager to learn something new and was approved to re-train in the Airfield Management career field. Airfield Managers start their careers as flight dispatchers to learn the nuances of flight operations; this prepares them to better understand how the airfield system plays into flight planning, and to take on progressively more complex roles in airfield operations, airfield management, and airfield capital improvement planning. This experience provided a diverse and dynamic aviation foundation to serve me well as I transitioned to civilian life following my military retirement in 2014.

Like many transitioning veterans, I was hit with the reality that despite my well-rounded experience within aviation, getting a job interview proved difficult without a four-year degree. To remedy this, I opted to enroll in the urban planning program at the University of Utah. Since I was a child, I have always been fascinated with the built environment and the various systems that make a city function. In this program, I was exposed to the tireless work of land use planners, transportation planners, urban designers, and economic developers. I quickly grew a deep appreciation for the work that these planners accomplished to advance solutions for some of society's most complex issues, such as homelessness, transportation inequities, and food insecurity. It did not take long for me to start questioning the role of aviation in solving or exasperating these deeper societal problems. I hastily concluded that aviation was disproportionately serving higher-income professionals at the expense of lower-income and marginalized communities around airports, where aviation-induced negative externalities are concentrated; this disturbed me to the point that I vowed to abandon my aviation experience and seek work in a more traditional planning field.

I immersed myself in urban design, food system planning, and transportation planning. I was reinvigorated at the prospect of advancing human-scaled design that promoted multimodal solutions that started and ended with an active transportation trip. With my remaining GI Bill, I attended culinary school to learn more deeply how whole fresh foods can serve as a cornerstone in healthy communities and the built environment. Still, something was not sitting right with me. Aviation provided me with so much, and ignoring the pull back towards it wasn't easy. Finally, I confided in a mentor, and he asked why I desired to leave aviation. After explaining myself, he suggested I re-engage within the aviation industry and bring with me the lessons I learned in planning. He assured me that there was a need within aviation to resolve the very issues that I was so passionate about. This conversation catalyzed my re-entry into aviation and sparked my interest in furthering solutions around aviation and community integration.

Upon my final semester, I obtained a job as a transportation planning intern at the Utah Department of Transportation. As fate would have it, my first day was also the first day of the Department's new Aeronautics Director. As we spent time together during onboarding, he listened to my ideas and vowed to give them a platform. He worked with the Planning Director to create an innovative partnership where I would split time between the Transportation Planning Division and the Division of Aeronautics. While at the Planning Division, I advocated for the recognition of aviation as a part of the broader transportation system. While at the Aeronautics Division, I advocated for multimodal solutions, equity, and economic development as a part of the Division's aviation system planning efforts. I visited Associations of Governments, Metropolitan Planning Organizations, Economic Development Districts, and local governments to educate them on the potential of the airport resources within their respective jurisdictions. I helped them see airports as

transportation infrastructure waiting to be activated to anchor new economic activity centers.

As this work gained momentum, a new buzz emerged around electric aircraft with vertical takeoff and landing capabilities. Aircraft manufacturers proposed a new transportation mode that would revolutionize the transportation system. These electric vertical takeoff and landing aircraft, more affectionally referred to today as eVTOLs, promised to eliminate emissions, dramatically reduce noise, and be more accessible to a broader range of residents; this was the aviation opportunity to blend my passion for aviation and land use / transportation planning. I immediately got to work educating communities on AAM and how we might prepare.

Unfortunately, cities had grown weary of new mobility technologies. Ride-sharing services and electric scooters launched and scaled rapidly in cities in 2012 and 2017. Without collaboration and an opportunity to properly plan, cities struggled to understand the impacts on safety, the environment, and infrastructure. These events flagged a need for cities to understand and prepare for new mobility technology, such as AAM, while also protecting community interests.

The City of Los Angeles led in this regard when it created Urban Movement Labs (UML), a transportation incubator designed to foster innovation and collaboration between government, industry, and the community. UML was launched with the goal of bringing together stakeholders from across the mobility industry to address common challenges and opportunities. City officials recognized that they needed to work more closely with industry partners to address these challenges and create a more sustainable and equitable transportation system.

Advanced Air Mobility became part of UML's portfolio in late 2020. In early 2021, I was hired as the program's Advanced Air Mobility Fellow. My role involved engaging with city officials, industry partners, and community stakeholders to explore the technical, regulatory, and policy challenges of integrating AAM into the urban transportation system. Some of the specific activities that I led included hosting a series of AAM-focused outreach events with community-based organizations, transportation advocacy groups, and other stakeholders; as well as collaborating with the FAA, NASA, and other jurisdictions to identify regulatory challenges and opportunities; and finally, working with AAM industry partners to identify potential use cases and operational scenarios for AAM in urban environments.

In this role, I was led by some of the most knowledgeable, thoughtful, and compassionate leaders across all planning disciplines. I am genuinely grateful for the opportunity to learn from them and to have their leadership shape who I am today. Not only did I get to work with the great staff within the City of Los Angeles, but I also enjoyed the opportunity to interact and collaborate with cities around the globe as they also explored the integration of AAM technologies into their transportation systems.

With this context, the following sections detail my observations with recommendations that are aggregated from my entire body of work. I hope you find these insights helpful and actionable as you consider the FAA Reauthorization Bill and the role of AAM in reshaping our cities for a more sustainable future.

Observation 1: Today, aviation users enjoy benefits to the detriment of residents who are the least likely to have the means to access aviation services. Conversely, those with the least access to aviation services are more likely to bear the burden of aviation's negative externalities.

Airport Economic Impact Studies across the nation communicate the economic benefits of airports and promote airports as 'economic engines.' Airport supporters herald these results as reasons why continued support for the airport is vital to the community. What is often lost and not studied in these reports is precisely who and who is not benefiting from aviation-enabled economic benefits. In the paper, *The Spatial Distribution of Airport-Related Economic Activity*, the author explores the link between airports and economic impact at the regional scale. Findings show that economic benefits for many airports are often disproportionately concentrated far enough away from the airport where negative externalities are no longer a quality-of-life factor. These findings mean that those suffering from exposure to noise and emissions are less likely to enjoy economic benefits. Because communities adjacent to neighborhoods are often low-income, marginalized communities, they are also less likely to have the economic means to access airport services directly. Access to benefits and freedom from negative externalities are simply not equitably distributed for most airports.

The role of multimodal connectivity in encouraging equitable advanced air mobility outcomes is paramount in fostering a sustainable and inclusive transportation ecosystem. By integrating different modes of transportation, such as public transit and active transportation, good multimodal connectivity enables seamless and effi-

cient travel for people across various socio-economic backgrounds. This holistic approach to surface transportation and aviation infrastructure offers potential to bridge the gap between urban and rural communities, providing access to essential services and employment opportunities while fostering social cohesion. Moreover, it reduces the divide that often exacerbates inequitable outcomes, ensuring that the benefits of advanced air mobility are shared more evenly. By promoting universal accessibility and affordability, multimodal connectivity plays a vital role in mitigating disparities in transportation, ultimately contributing to a more just and sustainable society. A multimodal hub that features an aviation component ensures that infrastructure investments benefit all other users of that transportation hub.

Recommendation 1: Seek to balance who is burdened by aviation with who benefits while prioritizing equity in all AAM ecosystem areas and multimodal development.

It is recognized that the FAA's number one priority is safety. Therefore, looking at safety through the lens of equity is helpful. Scheduled passenger airline service holds the title of the safest mode of transportation. Crash risk mitigation is maximized for aircrew, passengers, and non-participating bystanders. This mitigation is accomplished through harmonizing various parts of Title 14 of the Code of Federal Regulations (CFR), Chapter 1.

The FAA identifies five ecosystem areas of AAM: Aircraft, Airspace, Operations, Infrastructure, and Community. These ecosystem areas correspond with various sections of Title 14, CFR, Chapter 1.

A dive into 14 CFR, Chapter 1 shows that the advancement of aviation safety in scheduled passenger airline service has been achieved through the harmonious interplay of numerous parts of the CFR that correspond with the FAA's five AAM ecosystem areas. These regulations create a comprehensive framework that ensures the highest levels of safety. Unfortunately, this same level of harmony is not achieved as clearly for Part 135, *On-Demand and Commuter Operations*, and Part 91, *General Aviation*; this is especially true for private infrastructure where regulatory enforcement and airspace protections are not evenly applied (explained in more detail in Observation 4). To be clear, I do not recommend applying the same rigorous standards from Part 121 to Part 135 but challenge the FAA to be deliberate and seek out similar harmonization across the different areas.

For example, a Part 121 operation, if experiencing engine troubles upon takeoff, can rest easier knowing that Part 121 uses aircraft certified under Part 25. Part 25 ensure that aircraft feature one-engine inoperative capabilities for continued safe, albeit degraded, flight. The airspace surrounding airports accommodating Part 25 aircraft and Part 121 operations is protected to prevent obstacles and hazards through Part 77. Part 139 ensures that the receiving airport is capable of responding to the incident and features more stringent design standards to ensure the airfield environment is safe for a variety of emergency scenarios.

In comparison, for eVTOL certification, the FAA proposes a requirement for a controlled emergency landing, yet it is not defined where this landing is likely to occur. If following Part 135 precedents, an emergency landing will occur out in the community. Do city leaders and community members know where the location of a possible emergency eVTOL landing may occur, should they experience power issues on take-off? This risk should not just be mitigated on the aircraft, as the proposed airworthiness criteria addresses, but should also be addressed in airspace protections, infrastructure design, and operation specifications specific to urban hazards. Another concern is that in the event of an emergency landing away from the heliport or vertiport, will the community's fire department be able to respond to the incident with the right equipment, resources, and trained crews? It is this harmonization that the FAA should be seeking in addressing the entire AAM ecosystem. While this section's focus is on crash risk mitigation, equity concerns also include noise and emissions exposure, access to economic benefits, freedom from negative externalities, and more.

Legislation should be comprehensive in its approach to supporting AAM integration into communities. Funding for research into developing strategies to maximizing equitable outcomes should be included in reauthorization legislation. Results from these studies should inform strategies to extend AAM services to underserved communities, including suburban and rural areas, particularly in a natural disaster where aviation infrastructure and services are critical to disaster resiliency.

Observation 2: Cities are struggling with the complex issues of today and have little bandwidth to dedicate to emerging, but not yet real, technologies.

Urban Movement Labs was created to explore emerging transportation technologies and help city staff remain focused on day-to-day issues. By creating a dedi-

cated “innovation group,” local jurisdictions can explore new technologies and consider their implications on the community before being confronted with an urgent need for responsive policies and regulations. Funding this type of effort is challenging and often not included in city budgets as resources are understandably allocated to present and more immediate issues.

Furthermore, finding staff with a mix of land use and transportation planning experience is relatively easy as most university planning programs include courses, and even specialty tracks, on such topics. In a typical transportation planning course, students are exposed primarily to surface transportation modes, such as street and highway planning, transit planning, and active transportation planning. Absent from these courses, though, is aviation. Many large and medium cities support at least one airport, and often many. However, it is unfortunate that these airports exist in silos where aviation is the sole focus within the silo, and other transportation modes are the focus outside of the silo. This phenomenon is reflected in planning programs across the country. If students do desire an aviation planning course, or even an introduction to aviation, they must seek an aviation-specific program.

Non-profits like Urban Movement Labs, the Community Air Mobility Initiative, AeroX, MassAutonomy, and the newly formed Advanced Air Mobility Institute aim to bridge this gap and support communities in advancing technology fostering holistic integration. Non-profits, however, do not create guiding policies within cities; this is a function reserved for cities. Some communities might engage consultant support, but to even do this effectively, project managers must have a baseline foundation of aviation knowledge that is largely absent today.

Finally, cities have developed tools to manage new mobility technologies. Los Angeles Department of Transportation’s Mobility Data Specification (MDS) is an example of such a tool. Digital infrastructure tools, like the MDS, are playing a crucial role in helping cities plan for future enabled by new mobility technologies. As cities continue to grapple with the rapid growth of new mobility technologies, such as ride-hailing, bike-sharing, electric scooters, and AAM, they need better tools and data to manage these services effectively. The MDS provides a standardized format for sharing information about mobility services, allowing cities to collect and analyze data from different transportation providers in a consistent and transparent manner. This helps cities to identify trends, monitor compliance with regulations, and improve urban transportation planning. By promoting transparency and accountability among transportation providers, the MDS and other digital infrastructure tools are helping cities to create a more sustainable and equitable transportation system that benefits everyone.

Recommendation 2: The FAA Reauthorization Bill should incentivize cities to dedicate resources to exploring and engaging with AAM-specific issues related to challenges within local transportation systems, and the further development of digital infrastructure tools.

This can be accomplished through targeted grants and fellowships that fund staff dedicated to understanding the implications of AAM on urban environments. The legislation should also consider ways to incentivize university planning programs to include aviation courses.

In the short term, to address more immediate needs, legislation should consider ways to fund non-profit organizations that provide research and technical support to cities and educate staff on roles and responsibilities as they begin to integrate AAM technologies; this might include work that identifies where a city’s transportation system is struggling to meet critical needs, such as emergency and medical transport, and disaster response. For example, congested freight corridors might benefit from an AAM intervention if it can reduce exposure to truck noise and emissions along busy corridors. Likewise, an underutilized and struggling small general aviation airport might benefit from a land use and transportation strategy that leverages connectivity opportunities to create jobs and economic activity centers made possible by new AAM-enabled connectivity. Furthermore, funding to further develop digital infrastructure tools, specific to AAM, but compatible with existing toolsets is critical for cities to oversee AAM operations and promote the safety and wellbeing of all residents.

In conclusion, the pending FAA Reauthorization Bill presents a unique opportunity to create incentives and funding opportunities that further community interests in AAM technologies. Cities must have access to resources to explore and engage with residents and AAM interventions to leverage these new technologies for each locality’s unique benefit.

Observation 3: Federal, State, and local aviation professionals are often unaware of how aviation fits into the larger transportation system.

While cities have identified a need to be more attuned to aviation integration matters, they should not shoulder all of this work. Instead, aviation professionals at the State and Federal levels should also be more aware of aviation's role in the larger transportation system. It is recognized that the FAA has Congressionally mandated jurisdictional authority of the National Airspace System (NAS), however, when community members have an issue with decisions that expose them to more aviation noise and emissions, their first stop is usually not the FAA, but their local elected officials and city staff; this often results in a scenario where FAA staff struggle to understand and empathize with local sensitivities. This struggle makes creating holistic and collaborative solutions difficult for all involved stakeholders.

Recommendation 3: The FAA Reauthorization Bill should fund educational programs and resources to increase the awareness of aviation professionals on how aviation fits into larger transportation systems and how residents perceive aviation's negative externalities and benefits.

This could be accomplished by providing additional staff and resources to FAA offices that regularly interact with local jurisdictions to understand local sensitivities better. This effort should be ongoing, as one-off studies often focus on a small number of present-day issues where in reality, problems have evolved and morphed over time, masking root causes. Ongoing dialogue and listening sessions can help FAA staff develop responses and interventions to an issue's root cause or help to explain why a decision was made and how it ultimately benefits the community.

There is also an opportunity for universities with aviation-specific programs to develop community-focused planning courses that provide meaningful training and understanding of local community sensitivities; this could help bridge the gap between general planning programs and specialty disciplines like airport operations, air traffic control, and airspace regulations. In turn, this would provide better-prepared professionals to advance the FAA's mission of safety and efficiency in U.S. airspace systems while promoting an understanding of local community interests and needs through the lens of equity.

In summary, we must consider both the technical aspects and public acceptance criteria when planning future AAM initiatives. The pending FAA Reauthorization Bill is a unique opportunity to create incentives and funding opportunities that further community interests and AAM technologies. With thoughtful planning, we can ensure the success of new innovative aviation approaches while still maintaining public acceptability.

Observation 4: We are evolving from an unstable infrastructure foundation.

Despite the recent hype around the term "Urban Air Mobility," we must recognize that urban aviation has a long history in cities, dating back to the 1950s. However, the current structure of urban aviation has been largely built on an unstable foundation. Heliports are not always built to FAA design standard. Even when they are, they are rarely inspected regularly to ensure they continue to meet design standards. As a result, it takes little time to find heliport facilities rife with obstruction hazards, equipment in disrepair, and other undocumented and unmitigated risks.

Today, an airport or heliport is entered into the FAA's Airport Master Record system via the submission of the FAA Form 7480-1, *Notice for Construction, Alteration, and Deactivation of Airports*. This form collects all pertinent information to populate the FAA Form 5010, which is then used as a reference data sheet that contains information relevant to safe flight, including landing surface dimensions, known flight hazards, noise-sensitive areas, and other information.

Airports today are typically inspected every one to three years for smaller general aviation airports and annually for large airports supporting scheduled passenger airline service. Information on each airport's 5010 entry is updated to ensure operators have the most up-to-date information. In the interim, for new or short-term hazards, airport operators communicate risk to aircrews via the Notice to Air Missions (NOTAM) system. The importance of this system made national news in January when the NOTAM system experienced a system-wide outage, forcing the FAA to issue a 'ground stop' across the nation.

Heliports, on the other hand, are typically not part of the National Plan of Integrated Airport System, nor are they typically part of a Statewide Aviation System Plan. 99% of heliports are privately developed and operated. They are not subject to a rigorous inspection protocol where new risks are identified and communicated to aircrews. Furthermore, most heliports are not part of the NOTAM system. Operators often rely on local knowledge and experience to anticipate hazards and risks. When the 5010 database is consulted, it is possible that information is out of date

or inaccurate, sometimes by decades. A 2019 NASA report (ACN: 1599969) estimated that 1,600 to 1,800 heliports in the United States are not included in the 5010 database. If a heliport does not exist in the 5010 system, new airspace entrants, including eVTOL operators, will not be aware of their existence and associated hazards.

Some states, such as California, inspect hospital heliports, but staffing and resource constraints still make this task challenging. Many city officials are unaware of the inherent risks in today's legacy system; those that are aware need help to find resources and trained staff to remedy the issue. This reality may be perceived as acceptable today, likely because the relatively low tempo of urban aviation operations makes the risk probability of an incident low. However, as operations scale, these unmitigated risks threaten to expose residents to aviation hazards on an unprecedented scale. For example, the Uber Elevate White Paper, *Fast-Forwarding to a Future of On-Demand Urban Air Transportation*, states that on-demand charter and commuter operations (operated under 14 CFR Part 135) have twice the fatality rate of privately operated cars. This statistic indicates that risk probability within urban environments may be higher than we know.

In the 2021 paper, *A Retrospective & Historical Analysis of Vertical Lift Infrastructure*, the authors explored the role of infrastructure in helicopter accidents. In the majority of the reviewed accidents that occurred on heliports, infrastructure was identified as a common key factor. Obstructions were the most common issue. Facility design and size were a factor in 90% and 40% of accidents, respectively. Wind was a factor in 30% of accidents. These are avoidable incidents through proper design, inspection, and risk mitigation.

Recommendation 4: The FAA Reauthorization Bill should include measures that help cities better regulate and manage urban aviation systems that include private facilities, through inspections, active risk mitigation, and communication.

Legislation should consider ways to reduce costs for states and cities in meeting their obligation to provide a safe and efficient urban aviation system containing private infrastructure where the FAA does not have jurisdictional authority. This effort might include supporting university planning programs with heliport (and future vertiport) facility design familiarization, inspection procedures, and risk mitigation strategies. Funding organizations like NASA or even non-profit organizations to help inventory and inspect infrastructure to establish a new baseline before the implementation of AAM can serve to reduce risk and set new precedent for safety.

Through these efforts, we can create a safe environment for communities and encourage Advanced Air Mobility (AAM) development from a strong foundation. Ultimately, this paves the way for adopting AAM systems and a safe scaling to higher operation tempos in urban environments.

Observation 5: The aviation industry is not taking advantage of existing talent to the maximum extent possible.

All major media outlets frequently cover the aviation industry's pilot shortage. However, what's often overlooked is the similar shortage of all other supporting roles and functions. From maintainers to dispatchers to air traffic controllers, many supporting functions are not receiving the attention they deserve.

As outlined in my opening statement, much of my experience in this space comes from my military service. Having spent much of my military career in a contingency mode, dynamic and ongoing risk mitigation is a critical part of safe operations. Unfortunately, many military Airfield Managers are often faced with a typical response to their job applications. Military airfield management is unjustifiably seen as 'different.' With this statement, transitioning veterans are bypassed and unable to prove their value.

Furthermore, in addressing workforce challenges, diversity is vital. I am very encouraged by the diversity that AAM is attracting. Seeing women, people of color, and diverse backgrounds is a welcome change to the aviation workforce landscape. The example that the Choctaw Nation provides in its leadership is inspiring and similar programs should be encouraged through funding and support.

Recommendation 5: The FAA Reauthorization Bill should include measures to encourage diversity in the aviation workforce, provide training and education programs for transitioning veterans, and incentivize private companies and organizations to assist with the recruitment of new personnel.

Diversity is a critical factor in successful operations when we consider risk mitigation and safety. By having a diverse workforce, we can better understand and respond to the nuances of different communities. Furthermore, veterans often have a unique combination of valuable experiences in the aviation industry. The wealth of knowledge they bring from their respective branches should be encouraged through

measures such as the transitioning veteran training programs and incentives for private companies.

By including funding and support measures in the FAA Reauthorization Bill, we can ensure a well-rounded aviation workforce is ready for AAM's challenges. Additionally, this would further bolster an environment where equity, risk mitigation, and safety are top priorities, allowing AAM systems to operate safely and securely. Ultimately, this will enable communities from all walks of life to enjoy the benefits of AAM-supported operations.

CONCLUSION

In conclusion, support from Congress for these recommendations will help create a safe environment for communities and encourages the development of Advanced Air Mobility (AAM) from a strong foundation. This foundation, in turn, will pave the way for adopting AAM systems and a safe scaling to higher operation tempos in urban environments. Thank you for your time and consideration in this vital matter. I am confident that together we can create an environment where everyone can take advantage of Advanced Air Mobility's incredible potential.

This testimony has been submitted as part of the pending FAA Reauthorization Bill, and I am confident it will help ensure safety for all communities affected by AAM operations. We must invest in our infrastructure, our workforce, promote diversity, and provide opportunities for our veterans to serve in critical aviation leadership roles. Only then can we realize the incredible potential that this new mode has to offer.

Thank you once again for allowing me to share my perspective. I look forward to partnering with you to bring forth a new frontier in aviation and transportation.

Mr. YAKYM. Thank you, Mr. Harper.

I ask unanimous consent to enter into the record additional testimony and material on AAM that we received from Supernal, HAI, and Reliable Robotics, as well as AUVSI.

Without objection, so ordered.

[The information follows:]

Letter of March 30, 2023, to Hon. Sam Graves, Chairman, and Hon. Rick Larsen, Ranking Member, Committee on Transportation and Infrastructure, from Supernal, LLC, Submitted for the Record by Hon. Rudy Yakym III

MARCH 30, 2023.

Hon. SAM GRAVES,
Chairman,
U.S. House of Representatives, Committee on Transportation and Infrastructure,
2165 Rayburn House Office Building, Washington, DC 20515.

Hon. RICK LARSEN,
Ranking Member,
U.S. House of Representatives, Committee on Transportation and Infrastructure,
2163 Rayburn House Office Building, Washington, DC 20515.

DEAR CHAIRMAN GRAVES AND RANKING MEMBER LARSEN,

Please accept this written testimony of Supernal, LLC (Supernal) for the March 30, 2023 hearing docket. Supernal appreciates the responsiveness and availability of your staff to discuss your ongoing work to pass an FAA Reauthorization on-time.

Supernal is a U.S. manufacturer of electric vertical takeoff and landing (eVTOL) aircraft with headquarters in Washington, DC and research, engineering, and design facilities in California. What distinguishes Supernal from other aircraft manufacturers is our relationship to the Hyundai Motor Group, which guides our human-centered approach to developing a more accessible and inclusive future of mobility that is sustainable and multi-modal. Supernal is dedicated to creating the most accessible mode of transportation for people with disabilities, and creating an Advanced Air Mobility (AAM) ecosystem that democratizes affordable access to transportation.

Our dedication to setting the industry standard for accessibility in mobility is guiding our vehicle and infrastructure designs, the policies and regulations we advocate for at all levels of government, and our collaborative efforts with leading orga-

nizations and academic institutions. As Supernal envisions this industry, AAM can create equitable access to transportation for people of all races, ethnic groups, geographies, socio-economic statuses, and people with disabilities or who face significant challenges with existing transportation options.

But AAM is about more than just novel aircraft. It is an ecosystem of interconnected and interoperable infrastructure, technology, and services that must function simultaneously in support of aircraft operations in the National Airspace System (NAS). In order to thrive as an industry, AAM will need to connect people living in exurban and rural communities to the places they work. We believe the federal government's role in creating a thriving AAM industry is twofold; first, to enact timely policies and standards, and second, to ensure robust and fair competition that best serves the public.

STANDARDS AND POLICIES

The FAA must complete regulations, guidance, and processes to ensure that the AAM industry has the same certainty of the regulatory path as traditional aviation. Short term, temporary regulatory actions, such as the Special FAA Aviation Regulation, must address a safe approach to the emerging technologies without the limiting assumptions of old technology. The SFAR is an initial action that must be followed by guidance and processes that embrace how new technologies meet the demands of safe and sustainable transportation in and around our cities. In addition, FAA leadership and staff must transform the culture to focus on the safety value of AAM rather than the differences between AAM and more traditional aviation technologies.

The FAA Engineering Brief on Vertiport standards must follow safety objectives that address the characteristics of AAM aircraft without over generalizing the performance characteristics of AAM aircraft. Aviation regulations are most effective when they manage the current safety risks while providing flexibility in the methods and technologies used to address safety concerns as they evolve.

ENSURING FAIR COMPETITION AND ACCESSIBILITY

Just as important as creating the regulatory framework that will enable safe integration of AAM aircraft into the NAS is the federal government's role in ensuring fair competition and consumer protections.

Supernal applauds Congress for including vertiport planning grants in the FY2023 Omnibus Appropriations legislation. In some cases, communities that could benefit the most from improved mobility lack the resources necessary to attract operators, and these grants are a definitive first step toward creating AAM's supporting infrastructure ecosystem for the benefit of all. Supernal asks that as Congress considers additional resources for AAM infrastructure during debates on FAA Reauthorization, that you include the same kind of important protections that have ensured the highest and most beneficial use of Airport Improvement Program (AIP) funding for decades by requiring project sponsors who accept federal funding to maintain their facilities as open to all safe and certificated operators, and set rates in a way that is fair and transparent.

In order to thrive, AAM will need to connect people living in exurban and rural communities to the places they work. In some cases, communities that could benefit the most from improved mobility lack the resources necessary to attract operators. The Small Community Air Service Development Program ("SCASDP"), aids small communities in addressing air service issues. SCASDP's eligibility criteria are broader than the Essential Air Service ("EAS") program and provide a grant applicant the opportunity to self-identify its air service deficiencies and propose an appropriate solution, while EAS is a direct subsidy to air carriers and serves a statutorily limited universe of eligible applicants. The SCASDP program's eligibilities are also broad enough to enable communities to undertake air service development activities, and not solely subsidizing seats. This existing program is an opportune vehicle to provide interested communities with the resources they need to create AAM partnerships, but would likely require minor changes to definitions in statute.

AAM holds the potential of transforming how people with disabilities travel. Historically, people with disabilities have found flying on the airlines to be difficult and even dangerous, as evidenced by the U.S.D.O.T. complaints portal. The novel designs of Advanced Air Mobility aircraft create opportunities to make air travel more accessible to previously underserved populations, including people with disabilities. But there is currently no federal standard for crashworthy wheelchairs, which means that even if a manufacturer wanted to, the FAA could not approve a new in-cabin wheelchair or wheelchair restraint device.

Section 432 of the FAA Reauthorization Act of 2018 directed a study of the feasibility of in-cabin wheelchair restraint systems and how to accommodate powered-lift wheelchairs. That study was completed in 2021 and it had two important findings: first, that nearly all existing powered-lift wheelchairs exceed the FAA's horizontal impact standard but that there is no wheelchair test data on vertical impact or flammability performance. Second, the study concluded that it was likely to be technically feasible to design a wheelchair that would comply with all FAA standards, if data and guidance from the FAA were more complete.

Given that the report mandate is now closed, Congress should take the next steps to act on the study's findings. The FAA must test and evaluate existing wheelchairs that meet similar automobile crashworthiness standards to ascertain alignments and gaps. Once that evaluation is complete, the FAA must partner with academia and industry to provide the resources to design an FAA-compliant wheelchair and wheelchair securement systems. Finally, the FAA must promulgate a performance standard for crashworthiness and flammability performance for wheelchairs and wheelchair securement systems, through rulemaking.

Congress has an opportunity to create a partnership between the FAA and industry on research and development to better accommodate these individuals as we develop the next generation of air transportation, and Supernal asks that you consider resources necessary to do so.

Supernal shares many of the Committee's goals for this FAA Reauthorization: integrating transformative, clean aviation technologies into the NAS that will improve mobility for all. We appreciate the opportunity to submit testimony, and would be pleased to discuss any questions with you.

Report, "Roadmap of Advanced Air Mobility Operations," Helicopter Association International, February 2023, Submitted for the Record by Hon. Rudy Yakym III

The 33-page report is retained in committee files and is available online at https://rotor.org/wp-content/uploads/2023/05/HAI_Advanced_Air_Mobility_Report_04-07-2023.pdf.

Statement of Robert Rose, Co-founder and Chief Executive Officer, Reliable Robotics Corporation, Submitted for the Record by Hon. Rudy Yakym III

Chairman Garret Graves, Ranking Member Cohen, and members of the House Transportation & Infrastructure Committee, Subcommittee on Aviation:

Thank you for holding this hearing to discuss how the upcoming Federal Aviation Administration (FAA) reauthorization will address the certification, operational approval, and integration of new entrants. Operating the safest and most efficient aviation system in the world is the FAA's mission, and new entrants are developing technologies that will radically improve aviation safety. Fostering an innovative environment that allows new safety-enhancing technologies to be introduced to aircraft and the airspace system will save lives and position the United States to continue to be the leader in aerospace and aviation safety globally.

Reliable Robotics was founded in 2017 to develop and bring to market aviation safety-enhancing technologies, including auto-land, auto-taxi, and auto-takeoff, as well as high-precision navigation and remote piloting capabilities. These technologies will prevent many common causes of fatal aviation accidents and save lives. Last year, the FAA accepted the certification basis for the Reliable Robotics continuous engagement autopilot and high-precision navigation system.

TECHNOLOGY WILL DELIVER TRANSFORMATIONAL SAFETY IMPROVEMENTS

In previous hearings, this subcommittee has identified that the safety record for general aviation flights and for air charter operations performed under Part 135 of the Federal Aviation Regulations is significantly worse than the record for scheduled airline operations. For Part 135 charter operations, accidents are 6.5 times more frequent than in scheduled Part 121 airline operations.¹ Recent studies have

¹NTSB. "Annual Summary of US Civil Aviation Accidents." Based 2011–2021 data.

concluded that flying on a general aviation aircraft is between 8 and 15 times more dangerous than driving.²

As a nation, we possess the aviation safety-enhancing technologies that could prevent more than 71% of these fatal accidents.³ However, the FAA and interagency partners must dedicate the necessary resources to prioritize their certification and operational approval. During the recent full Committee hearing on aviation safety, David Boulter, FAA Acting Associate Administrator for Aviation Safety, emphasized the role safety-enhancing technologies will play in preventing accidents. Mr. Boulter explained that certified auto-land systems are life-saving and will be a “game changer” for aviation safety.⁴

Enabling continuous autopilot engagement through all phases of flight will eliminate loss of control (LOC) and controlled flight into terrain (CFIT), two leading causes of fatal general aviation accidents.⁵ Tragically, nearly 95% of LOC accidents result in flight crew or passenger fatalities.⁶ Continuous autopilot engagement will also improve the safety of taxi, takeoff and landing, where more than 60% accidents occur during Part 135 operations.⁷ With permanent and qualified leadership, resources and focus at the FAA, the certification of these safety technologies is within reach in the near term.

MODERNIZING THE FAA CERTIFICATION PROCESS

Reliable Robotics applauds the dedicated FAA workforce for their focus on certifying our continuous engagement autopilot and high-precision navigation system. Through this FAA reauthorization bill, we have an opportunity to provide the agency with much needed tools, leadership, and resources to transform aviation safety.

We are at an inflection point for aviation safety, with many safety-enhancing technologies, including auto-land, auto-taxi, and auto-takeoff, within reach for smaller aircraft. While some of these technologies are available on large commercial aircraft, they are prohibitively expensive and require costly infrastructure at airports. Our work with the FAA aims to correct this imbalance by giving smaller aircraft equivalent or better technology that can be deployed at substantially lower cost and with less infrastructure complexity.

On Feb. 24, Reliable Robotics submitted detailed FAA reauthorization priorities and legislative language to the Transportation & Infrastructure Committee. We look forward to our continued discussions on these priorities and the opportunity to participate in future reauthorization hearings.

UNITED STATES COMPETITIVENESS

Our competitors, including China and Europe, are making rapid advancements in the certification and operational approval of aviation safety-enhancing technologies and advanced automation systems. In 2022, the European Union Aviation Safety Agency (EASA) became the first aviation regulator to release a comprehensive regulatory framework for new entrants. China is actively developing large autonomous air cargo drones, and the government has announced operating standards for these aircraft. With government support, Chinese companies recently conducted test flights of uncrewed cargo aircraft designed for civil and military operations.

The United States is the world leader in aviation, and through this reauthorization bill, we can position ourselves to retain and grow this role. Thank you for your dedication to aviation safety and United States leadership.

Letter and attached 2023 FAA Reauthorization Bill Priorities and Proposals from the Association for Uncrewed Vehicle Systems International, Submitted for the Record by Hon. Rudy Yakym III

Please see pages 111–128 for the 18-page submission from the Association for Uncrewed Vehicle Systems International.

²Hook (U. of Tulsa), Sizoo (FAA), Fuller. “How Digital Safety Systems Could Revolutionize Aviation Safety.” IEEE/AIAA Digital Avionics Systems Conference. 2022.

³Ibid.

⁴House Transportation and Infrastructure Committee. “FAA Reauthorization: Enhancing America’s Gold Standard in Aviation Safety.” Feb. 7, 2023.

⁵General Aviation Joint Steering Committee. “GAJSC Approved Pareto for 2011–2020.”

⁶International Air Transportation Association. “Loss of Control In-Flight Accident Analysis Report.” 2019.

⁷Huang. “Analysis of Part 135 Accidents to Facilitate Flight Data Monitoring.” Based on data from 2008–2019. International Journal of Aviation, Aeronautics, and Aerospace. 2022.

Mr. YAKYM. The Chair now recognizes his good friend from New York, Mr. Molinaro, for 5 minutes.

Mr. MOLINARO. Thank you, Mr. Chairman. You both look like you are having far too much fun over there. I appreciate the opportunity.

Mr. Bevirt, I am going to jump right in. I don't want to waste too much of your time or mine.

In rural communities like the ones I represent, we often refer to the deserts we live in: banking deserts, food deserts, retail deserts. We have transportation deserts as well. AAM and eVTOLs provide us the opportunity, I think, to really bring back to life some of our smaller, more regional airports and use them as tools not only for long-distance but short-distance travel.

Within the context of FAA reauthorization—and I know that you have touched on it in your testimony, and, actually, Mr. Harper kind of noted some of it—the bureaucratic process to move from what we do to implementation at the airport level is 5 to 15 years.

Your technology, what Joby does, and the capacity to really innovate and bring back to life regions of our country, if not other parts of the world, demands that we act quickly.

What within FAA reauthorization would you think would allow us to advance eVTOLs, and AAM more generically, into those lesser served rural community airports?

Mr. BEVIRT. Thank you very much for your question.

I think, as you rightly point out, infrastructure is at the heart of bringing this to where we are hoping it will go in the short term. This country is blessed with an incredible number of existing airports and heliports, and, as you rightly note, it is vital that we bring those into our ecosystem and take full advantage of them to provide access to this new mode of transportation.

But we also need to add additional infrastructure, and we need to do that in a short timeline. And so, as we look to the FAA reauthorization, it is important that both the policies are in place to ensure that our existing airports and heliports are accessible to these aircraft and also an expedient process for permitting new vertiports.

And thank you again for your question.

Mr. MOLINARO. Thanks very much.

Mr. Clark, I wanted to offer—as I understand it, you have a test flight facility in New York and, obviously, some charging stations across the State. I don't know your presence in the 19th Congressional District, but I promise you, we would welcome a conversation to expand the footprint. We recognize, again, the value of AAM and the capacity to reach places that are underserved—all populations.

Why don't you, if you could, just expand on the capacity to provide service and what within FAA reauthorization we could more aggressively do to build out the footprint in places that are seeing a shrinkage in the traditional aircraft world and need revitalization of those transportation hubs?

Mr. CLARK. Absolutely. And thank you for your question. And this is near and dear to us up here in Vermont. We are right across the lake from you all in New York, and we have a whole network that extends across New York. We have our flight test center there.

And it has been a great State to deploy charging systems at the rural airports in.

What is interesting about States like New York, Maine, Nebraska, they have highway systems that are unidirectional, they are not universal. And in places where you want to go north into the Adirondack Park, you are better set flying. And it is an amazing economy booster to have those small businesses in those regions able to compete with urban businesses by allowing next-day cargo and logistics missions.

So, imagine a system in the future where the aircraft can leave your local regional airport—of which there are more than 4,000 underutilized airports. With very, very little in infrastructure improvement of charging, we can utilize those to serve these rural communities—medical, cargo, logistics, moving people.

And all we really need, in the case of the FAA, is consistency in the deployment of these charging systems. We have found a great variability in the regulations required for us to get through to permit charging systems at airports, and we just need consistency.

And on the aircraft, it is the same thing—the solidification of the goalposts around electric vertical takeoff and landing aircraft and conventional takeoff and landing aircraft.

So, resources, expertise, pointed at things that allow us to bring low-cost transportation to your communities.

Mr. MOLINARO. Thank you.

Mr. Chairman, I just want to reinforce that embracing AAM in a creative and innovative way allows us to bring back to life smaller regional airports and give transportation access to places that are underutilized and underserved. And we need an FAA reauthorization bill that is as innovative as the technology.

Thanks. I yield back.

Mr. YAKYM. Thank you, Mr. Molinaro.

The Chair now recognizes Mr. Menendez for 5 minutes.

Mr. MENENDEZ. I thank the chair.

And the chair actually had constituents here earlier. My in-laws live in the chair's district. So, I have to be nice to him when he holds the gavel, for a lot of reasons.

But it is also just fascinating, because I know the area that he represents, northern Indiana. And I represent a much more densely populated district. So, to have the opportunity to think about these issues with Rudy is going to be an interesting opportunity, and I am thankful for it.

But because of the district I do represent, I want to turn my questions to Mr. Harper.

And I appreciate your testimony here today and specifically your observations and recommendations.

And going specifically to your second recommendation, regarding how best cities can incorporate this opportunity while thinking about their various stakeholders, you make the correct observation that a lot of these communities that are in the Eighth Congressional District of New Jersey have not always had the benefit of the transportation systems around them but bear the burden of the environmental consequences.

So, as we think about this new technology and what it could mean for these types of communities, I want to give you the chance

to expand on your testimony and how we can make it an inclusive process and ensure that we create an opportunity for equity in those communities with new technology and make sure they aren't left behind.

Mr. HARPER. Yes. I appreciate that.

So, I think this starts with education. So, I think community members need to better understand aviation, better understand aviation's role in their daily lives.

I think, when we talk to a lot of communities that are around, particularly, general aviation airports, they struggle with the burdens of noise and emissions and other negative externalities, and the fact that they don't have direct access to the benefits of those airports.

We did an economic impact study in the State of Utah, and for one airport, we looked at where those economic impacts were being enjoyed. We might have taken a look at who were the employees of the airport, where do they reside at. And, by a vast majority, the economic impacts are spread out beyond the immediate communities adjacent to the airport. So, even those benefits the airports bring to communities aren't being felt by those impacted most by it.

And so, to mitigate that or to address that, I think the outreach is first and foremost. We need to get out there and talk to communities, hear what their concerns are. I think a lot of times we tend to assume what the big issues are, what the big concerns are, but we truly only know if we go out there and actually talk to the people that are impacted and get their ideas of what this infrastructure could be and really empower them with knowledge of aviation, to rethink of how that infrastructure might serve them in their own communities.

I think a lot of small general aviation airports have the potential to anchor multimodal centers, but because of the restrictive nature around how we develop around airports, it makes it difficult to envision how that is possible.

And so, I think we really just have to re-envision the role of infrastructure in small communities.

Mr. MENENDEZ. And, on that note, how can we also ensure that we are creating a workforce from these communities and giving them opportunities for training?

That is one of the things I think can cut across, no matter what part of the country we have the opportunity to represent, encouraging people to think about these unique opportunities with this emerging technology.

How do we train people from all different communities? What types of things should we be almost marketing to them, right, to give them the awareness and then give them the opportunity to be trained up, no matter what part of the country they come from?

Mr. HARPER. I think it needs to start with the local education systems, the community colleges and even K-12 education. You are hard-pressed in many colleges to find anything related to aviation in the coursework. I mentioned specifically planning, but if you look at other programs out there, there is really not a lot that touches on aviation, even from an introductory level.

And so, providing those options at the colleges and universities, and then also, we see a lot more of the drone introductions into the K-12 programs. I think that is a very positive step in the right direction to at least help community members see that they have or potentially have a role in this industry in the future.

Mr. MENENDEZ. For sure.

And, listen, if there are any programs that you find to be models, right, for bringing students into this space, definitely let the staff know, let my office know. Because we would love to make that available and create a resource for places in our different districts, so, that way, people know how they can set up these programs to engage students and potentially create a whole new career path that they may not be thinking of. I think we would all be well-served by that.

So, I thank you all for coming in today and for your leadership on this important topic, and I appreciate it.

I yield the remainder of my time.

Mr. YAKYM. Thank you, Mr. Menendez. And the sentiments you shared are mutual. You should let your in-laws know, if they have issues with their Federal Government, they can call their Congressman and I would be happy to help them.

I now recognize myself for 5 minutes of questions.

Thank you to our second panel for being here today. Thank you for waiting so patiently as we concluded our first panel.

Mr. Bevirt, I am not sure if you were here in the room during our first panel, but my question to them focused on American aviation leadership.

As I said earlier and have said many times, for the last 120 years in the United States, we have been the leader in aviation innovation, but I am concerned that we are starting to cede that ground particularly to foreign nations.

And, in your written testimony, you warned us that China and Europe are working on their own electric aviation regulations and that the United States runs the risk of being left behind.

What do those two areas, China and Europe, what have they done so far that we haven't? What are they working on that we aren't? And how can we—as crazy as this phrase may sound, how can we catch up?

Mr. BEVIRT. Thank you very much for the question. And, yes, I had the opportunity to join for the earlier session. It was excellent.

I think the critical piece—and this is really important; thank you very much for asking it—is, as you rightly note, the U.S. has been at the forefront of aviation for more than 100 years, and the technologies that we are developing for this next stage of aviation are happening here in the U.S. There is so much excitement, so much entrepreneurial spirit, and it has been going on for a long period of time.

What Europe and other nations around the world have done on the regulatory front that has been leading is they have provided clear guidance for the regulatory process. And that is very valuable.

The FAA has been working with many of the companies represented here and many companies in the industry and has been setting out specific guidance for each of us on the regulatory proc-

ess for certifying their aircraft. Those have been now codified in G-1s that have been published. And it is essential now that we hold firm on those G-1s and the course that has been laid out in those G-1s so that we are able to move expediently through the certification process.

As I mentioned earlier, we are in the process of running the tests on the parts and the systems on our aircraft. We are far down through the certification process. And so, any deviation on the up-front rules at this point would be very challenging.

And so, thank you very much for your question. We are very grateful for all of the thousands of hours that the experts in the FAA have put in to getting us to this point. And you are very right to note that there is a huge opportunity at stake.

Thank you.

Mr. YAKYM. Thank you.

And let's continue down that same track. We will take a slightly different path. Let's set aside everything that Joby is working on and that it has pending before the FAA, and let's talk about what else, in terms of whether it is approvals of certifications—what, outside of that, keeps you up at night.

Particularly, my interest in our community is, a lot of my district is rural. What is it about the rural parts of our country, whether it is workforce, electrification, infrastructure—what are some of those other things that really keep you up at night?

Mr. BEVIRT. Yes. Again, great question. And a lot of it is down to the infrastructure, whether that is the physical locations where these aircraft can take off and land from, whether it is the electrification that Kyle spoke about. It is key to bring the access to this really important new mode of mobility to as many people around the country as possible.

And so, I am very focused on how we complete the certification of the aircraft, but we also need to have infrastructure online in a timely manner to support the operations, with the certification of that aircraft.

Mr. YAKYM. Thank you.

And, briefly, to Mr. Bradshaw, same question for you. What outside of the FAA keeps you up at night as Bristow moves into the eVTOL and electric aviation space more broadly?

Mr. BRADSHAW. Well, fundamentally, our number-one priority is always going to be safety. We do have confidence that the companies developing these aircraft and the FAA will ensure that they are safe before certified and brought into operation. Importantly, though, it is critical that they be brought into operation safely, and that, in and of itself, is a separate process.

We have experience, working with different OEMs over the decades, introducing a variety of different new models into the market, and there is a process by which that maturity really needs to occur.

Beyond that, I think workforce. It is talent management. The industry as a whole is short pilots and other critical staffing positions already. The growth of the AAM industry, which we are confident will happen, is only going to further stress that need for talent in the industry.

So, an investment in the workforce, making sure that we are tapping into all segments of the community to bring new people into the industry, we think is going to be critically important.

Mr. YAKYM. Thank you, Mr. Bradshaw.

I yield back.

I would now like to yield 5 minutes to Mr. Allred.

Mr. ALLRED. Well, thank you, Mr. Chairman.

And I want to thank our witnesses for being here today and for your testimony. I think this is an exciting thing for us to consider as we look at the future of what our transportation systems can look like.

I am looking forward to working with all of you, as we continue through the FAA reauthorization process, to ensure that the FAA and the industry have the resources they need to continue expanding and developing in this space.

And, Mr. Bevirt, I wanted to start with you. I understand that Joby worked with NASA to understand how the electrical vertical takeoff and landing, eVTOL, aircraft can integrate into our existing airspace in Dallas and at the DFW Airport. As you know, it is a very busy airspace. We have a lot going on. It is the second busiest airport in the country.

Can you elaborate for us what you found in terms of that integration?

Mr. BEVIRT. Yes. Thank you very much. And we were very grateful for the opportunity to work with NASA and to study the DFW area, and very pleased with the results that demonstrated that our piloted aircraft can integrate seamlessly into the airspace in Dallas and specifically at DFW.

Mr. ALLRED. Yes.

What do you think we need to do to give the public confidence around that?

As I said, our airspace is incredibly busy. We have multiple civilian airports, also freight airports.

What do you think needs to be done in terms of making sure folks understand that this can be integrated safely?

Mr. BEVIRT. Again, given that our aircraft is a piloted aircraft, it integrates into the airspace in the same way that other small aircraft do.

And the more we get out and demonstrate these aircraft, as Kyle was talking about, bring them to communities, let them experience the remarkable characteristics that they have—the low acoustic signature, the ability to spool up and spool down nearly instantly—it just, as Kyle talked about, is a game-changer for safety and reliability and affordability, giving so many more people access and the opportunity to experience aviation on a daily basis.

Mr. ALLRED. Yes, I agree with you. I think it is exciting. I think there are probably few areas in the country that would benefit more than the Dallas-Fort Worth area from having something like this, and so, I am glad that you all were able to work with NASA and come to that conclusion.

And we have had a lot of discussion, Mr. Harper, around the workforce. And obviously, we need to make sure that we are keeping up with demand. Companies like DroneUp are working to build the next generation of trained operators through creative partner-

ships, like one they have with the Dallas Independent School District, a vocational STEM program, which is in my district.

But we also want to make sure that that workforce is something that reflects our incredibly diverse community. And this is something I have been working towards in the aviation sector in general, is trying to see us bring more diversity and open the doors to aviation jobs to more folks.

What things do we have to do to make sure that these new workforce opportunities are available to underrepresented communities?

Mr. Harper?

Mr. HARPER. Yes. I appreciate that question a lot.

I think, first and foremost, the next generation coming up needs to see themselves in the decisionmaking rooms where all of this is happening. All too frequently, in forums like this, I am the only person of color talking about this stuff and being considered as a thought leader in this space, which I am extremely grateful for.

When I graduated high school, I didn't have much going for me. I didn't do very many things to help myself out. It was through my military experience, through joining the Air Force, that I got introduced to aviation. And that really turned things around for me, gave me the confidence, gave me the knowledge and skills to do things. And so, that served as my introduction into the aviation workforce.

I think there is a lot of potential to embrace transitioning veterans, particularly airfield managers and others in the aviation space within the military. But it is a frustrating transition.

The TRB did a study a few years ago on workforce diversity, how to grow the workforce. And when I asked the question why military airfield managers weren't considered as a part of the solution to that, I was told very crassly that my skills weren't transferable and, therefore, they didn't even consider airfield managers.

And I think I have established that what I have learned in the Air Force is very relevant to what we are doing today. And I think we need to embrace that and embrace the diversity that the military offers.

Mr. ALLRED. Yes.

Thank you, Mr. Chairman, and I yield back.

Mr. YAKYM. Thank you, Mr. Allred.

The Chair now recognizes Mr. Carbajal for 5 minutes.

Mr. CARBAJAL. Thank you, Mr. Chairman.

Mr. Bevirt, with the upcoming FAA reauthorization bill, I appreciate the time you took to come to testify before our committee as we continue to work through our priorities.

Can you elaborate on how Joby Aviation's collaboration with the Department of Defense is helping to move forward advanced air mobility into civil operations?

Mr. BEVIRT. Absolutely. Thank you very much for your question.

So, we began working with the DoD in 2016. And the DoD provided us with access to flight test ranges, and that was really valuable to accelerate the development of our technology.

That was then followed on by increasing involvement through a number of steps, both through the Defense Innovation Unit and then through AFWERX Agility Prime. The small contract awards that we received from them we were able to leverage into dramati-

cally more funding from private sources. To date, we have raised almost \$2 billion from private sources on contracts of just a few tens of millions of dollars.

And so, that leverage, the DoD providing a demand signal, saying, these technologies are not only incredibly valuable on the commercial side but they are also going to be valuable for the Government, these technologies that dramatically reduce the maintenance cost and the operating cost of aircraft, that electric propulsion is a really promising technology, that quiet aircraft are really important for the defense community—so, again, that has been critical for us.

As we look to how this cascades into the commercial side, again, those flight test resources and our relationship with the DoD provides us with an early path to demonstrated operations with the Department of Defense. And, again, that flight testing and putting time on the aircraft, building out our operational muscle in advance of FAA type certification is invaluable.

And, again, we are very grateful for all the support from the DoD.

Mr. CARBAJAL. Thank you. As I sit on the House Armed Services Committee, that is really important to understand.

What else can Congress do to continue to promote innovation in welcoming new entrants into our airspace?

Mr. BEVIRT. So, I think, as we have talked about, this is a really remarkable time in aviation, with many new technologies. As Kyle talked about, it is not just battery-electric aircraft but also hydrogen-electric aircraft and new technologies on communications, new technologies on the processing and the flight control that make aviation dramatically more accessible, lower cost, and more environmentally friendly. And so—

Mr. CARBAJAL [interrupting]. But what can we do? What can Congress, specifically, do?

Mr. BEVIRT. So, we need the FAA, with the FAA reauthorization, to deliver a steady hand, consistency. And it is really important that there is a clear and consistent set of rules and regulations.

Mr. CARBAJAL. Thank you.

Mr. Clark, as we continue to make advancements in technology, what can Congress do to ensure the FAA has the proper resources and technical subject-matter experts in place to support the agency's advanced air mobility activities?

Mr. CLARK. Right now, the FAA is the gold standard in safety worldwide, and we have to keep it that way.

And it is actually a pretty simple answer to your question, in my opinion. They have expertise in structures and aerodynamics and flight controls and avionics, where they lack expertise is in the new technologies. They have to look a little sideways to other industries that have adopted electric technologies, put those subject-matter experts in place around electric motors, batteries, controls in the FAA, and give them the delegation authority to adjudicate on what is defined as safe.

We know what it is. Mother Nature, physics—we know what they are. We know we start with a fundamentally safer technology. We need the FAA to validate that. They have the authority and the responsibility. In fact, I think it is an injustice if the FAA doesn't

do it, because the FAA is tasked with making a safer aviation system. Continuous innovation has consistently done that in America.

Give them the tools by simply telling them, go get the expertise in those spaces that are necessary to advance advanced air mobility, and then give them the delegation to do it. And they need a forcing function to do so from Congress.

Mr. CARBAJAL. Thank you.

Mr. Chair, I yield back.

Mr. YAKYM. Thank you.

Are there any other Members who have not been recognized for this round of questioning who would like to ask any questions?

Seeing none, we will move into a second round of questions. And I will yield myself 5 minutes for a second round of questioning.

Mr. Bevirt, about a year ago, the FAA told Joby and other manufacturers that you had to pursue certification under part 21.17(b). Can you briefly describe how your industry, as well as your investors, reacted to that change?

Mr. BEVIRT. It was initially a challenging adjustment. We had received our signed G-1 in May of 2020, and to, more than a year later, have that adjusted was challenging. I think the piece that we were the most concerned about was on the operations and piloting side.

Since then, we have been extremely heartened by the rapid drafting of the SFAR, the Special Federal Aviation Regulations, that has come about and to hear that the FAA is a month ahead of schedule on that, that it is now with the DOT and will shortly go to the White House. And they remain committed to delivering that by December 31 of 2024. And, with that, we will be able to commence commercial operations on schedule.

We are also very pleased that our G-1 was published in the Federal Register and that the comments on that are being dispositioned expeditiously.

Mr. YAKYM. Thank you.

And, Mr. Bradshaw, as a company already using vertical-flight-capable aircraft commercially, what use cases are you looking at for this type of technology, and why are you so interested in it?

Mr. BRADSHAW. Thank you for the question.

We are excited about the applications and the end uses for these aircraft. The technology is very exciting, but, as an operator, it is the actual application of those, how they will be used every day to perform missions for customers that gets us the most excited.

We see a variety of applications for these aircraft. It is important to note that there are a number of different models under design and development today. They will have different best use cases.

For us, we think that the initial adoption and application will be for cargo and logistical solutions, for which our existing customers have great needs. We also think that there will be an expansion, then, into personnel transport, in our view, most likely through regional air mobility missions, connecting existing infrastructure today, but we do see it expanding over time to more urban air mobility missions as well.

Again, we see more of a crawl-walk-run implementation of this new technology into our day-to-day operations, as has been the case really since the beginning of the aviation industry.

Mr. YAKYM. And, also, Mr. Bradshaw, have you received any indication from the FAA about how they will establish pilot requirements for these aircraft?

Mr. BRADSHAW. I think additional clarity there would be very much welcomed.

We would like to see an adoption of the ICAO guidance, which would allow existing licensed commercial helicopter pilots to take a type rating course in any of these aircraft and, therefore, be designated as a powered-lift pilot for that aircraft. That is the type of clarity we think would be beneficial.

Mr. YAKYM. Thank you.

And, Mr. Harper, how is the FAA communicating to States and municipalities the timelines for expecting electric aircraft and powered-lift aircraft to enter production and service?

Mr. HARPER. So, honestly, I don't hear much from the FAA communicating that to communities. We hear most of that from the industry and through the industry communications, that they have achieved certain milestones along the certification pathway. And, from that, we recommunicate that out to the communities.

And so, as we understand it today, we are expecting initial launch sometime in 2025, with a scaling up of operations beyond that.

And so, that is the message that we are talking to communities, that is the timeline that we are giving communities to hopefully understand this technology and be able to provide feedback into the system of what it might look like.

Mr. YAKYM. Thank you.

And just kind of a general question for all panelists. If you could maybe even go through this just one at a time, briefly.

Do you have a view on how electric aircraft, and if, they should be paying into the Airport and Airway Trust Fund?

We will start with Mr. Clark and then go down the line.

Mr. CLARK. I think electric aircraft absolutely should participate in funding the infrastructure.

The economic benefits are compelling. There are customers, like Chris, ready to buy this and deploy it.

And I know from an aircraft—manufacturers are probably the most ignorant position to say this, but participating in the operational fees, which are insignificant relative to those of over-the-road gas taxes and other things, is absolutely something electric aircraft should do.

And we, as an industry, I would say, would be more than willing to participate in that, because we believe in good infrastructure, and the infrastructure is incredibly light relative to other forms of transportation.

Mr. YAKYM. Thank you.

Mr. Bevirt?

Mr. BEVIRT. I would just second what Kyle said. I wholeheartedly agree.

Mr. YAKYM. Mr. Bradshaw?

Mr. BRADSHAW. As a matter of principle, we think all users of the National Airspace System should pay into the fund. Obviously, with these new technologies, the details of that will need to be sorted out. I would defer to others on exactly how that will be incor-

porated. But, again, as a matter of principle, we think all users should pay into the fund.

Mr. YAKYM. And Mr. Harper?

Mr. HARPER. Yes, I would say I agree with my colleagues here and also emphasize, in my written testimony, I talked about some of the struggles and issues with the current vertical lift infrastructure that we need to address as we are looking to evolve into the AAM future.

Mr. YAKYM. Thank you.

And, Mr. Clark, in your testimony, you discussed the charging infrastructure that you have installed at airports.

Can you describe what permitting a charger at an airport entails to get it up and running and if there are areas that we should be looking at to ensure that the process is right-sized for the activity at the airport?

Mr. CLARK. Absolutely.

And I think it should be noted that putting a charging system, which is about a 4-by-4-foot box and a small powering connection adjacent to it, is a relatively small ask of an airport relative to the infrastructure of an airport.

The permitting process right now is slightly convoluted—actually, it is more than slightly convoluted. We go to the FAA, we go to municipal, and we typically go to a State in addition. And having a Federal preemption allowing us to put in charging systems at airports for the benefit of all parties, to allow for quiet, sustainable aviation at that airport, should be a no-brainer.

And the FAA should solely regulate that, especially at federally funded airports, and allow the diversity of municipal opinions to not impede the establishment of simple, simple chargers. And we are not talking about putting big vertiports in place; just a charger.

And I am also a big believer in interoperability and multimodal aspects of the charger that allow for package cars, other airport vehicles, and many different forms of aircraft to charge at those chargers.

Mr. YAKYM. Thank you.

I will now yield the balance of my time to our distinguished chair, Mr. Garret Graves.

Mr. GRAVES OF LOUISIANA [presiding]. I want to thank the witnesses, and I want to apologize to each of you for being out of pocket here for a little while. I want to thank the vice chair of the committee, Congressman Yakym, for taking over the hearing. Today was a busy day. We just passed landmark energy legislation that we have been working on now for about 2 years. And I apologize again for being absent.

I want to thank each of you for being here. I love the technology, I love the future that you are helping to create.

I am wondering if you could just talk through a little bit about your own experience here as compared to maybe what you have experienced in operating in other countries. I know that some of you are operating in other areas. Anybody care to comment about their experience in the United States compared to other countries?

Mr. CLARK. I mean, Chris probably has the most experience, but I will speak from the perspective of AAM. And you may be ref-

erencing a recent regulatory license we received to operate in the UAE, for example. And that came very quickly.

And the fundamental difference was the regulatory lab there and the GCAA was looking at the physics of the problem, understanding it is a safer technology than the existing technologies, and simply looked forward.

The FAA here, as good as they are—and they have an impeccable safety record, by all measures—is looking backwards to see how we fit within an existing regulation, as opposed to how it fits within the physics of operations.

And, within a matter of months, us and UPS achieved a license to operate in the UAE. And, frankly, I think that is wonderful. It is going to be a great start.

We need to do the same thing here in the U.S. and unblock, whether it be through waiver or otherwise, folks like Joby, folks like Bristow, for us to deploy our aircraft domestically.

Mr. GRAVES OF LOUISIANA. Mr. Bradshaw, before you answer, I want to ask maybe a related question, if you could take a twofer here.

The FAA has said that their infrastructure guidance will continue to be conservative until they have more operational data. When you look at the data that is being collected from international operations, how do you think that should be considered in the overall decisionmaking here, stateside?

Mr. BRADSHAW. Thank you, Chairman Graves, for the question. Appreciate it. And certainly understood about the busy day today. Glad to see H.R. 1 pass.

We do operate in a number of different jurisdictions around the world. We have a dozen different AOCs today, with aircraft in 17 different countries. So, we have a perspective of dealing with different regulators.

What we see with the FAA is very much a difference between the day-to-day experience we have with our FSDO and oversight over existing operations and then the airworthiness and certification process that takes place at the Federal level.

It does seem that we are behind other jurisdictions in the evaluation and certification process for these new technologies in many ways. I think there are various reasons for that. It seems that in other countries there has been a clear framework approach taken, not being as prescriptive. And there is certainly a commitment in some of these other jurisdictions, like EASA or the U.K. CAA or ANAC in Brazil, to be a leader here.

I have every confidence that the products that are being developed as new aircraft will achieve the performance and standards that they need, and hopefully the certification timeline here in the U.S. can keep up with that.

And hopefully the FAA, to the second part of your question, Chairman, will look to these other agencies and share that data and share the approach and take a more collaborative approach to how these new aircraft are certified and accepted.

Mr. GRAVES OF LOUISIANA. Any of you care to comment any more?

Mr. BEVIRT. I would just like to speak to the amount of international demand there is. And aviation has been one of this coun-

try's most valuable exports. And it is imperative that FAA continue to lead and be the gold standard for aviation safety globally so that innovators here in the U.S. can export the really valuable products that we create to countries around the world.

Mr. GRAVES OF LOUISIANA. Thank you.

Do you all feel that the FAA has clearly communicated the required design standards and development assurance levels that will be applied to your aircraft?

Mr. CLARK. I will jump in there.

I think that for 90 percent of the aircraft, they have. It is the new and novel technologies that need a little bit more work. And they need people who are experts in those fields to be employed by the FAA or delegated by the FAA.

Look, we want the same thing as the FAA. We want a safe, reliable, and repeatably produced aircraft, right? And we have a lot of experts that know electric propulsion and batteries very, very well. It is an engineered product. And the FAA has to step in in those relatively small slivers to say, "Yes, we want the same thing. Let's just figure out what validation means."

It should be noted in your prior question, though, that the rest of the world is drafting off of the work that is done here. And, in our case, getting these minimum viable licenses, they look to the work that our military did, the Air Force and the Army, before they put their pilots in our airplanes, and the airworthiness that we had to achieve to do that, to then draft off that and then ride by us towards the finish.

What we need to do is, we need to maintain that leadership position by continuing to be innovative, driving towards a forcing function of a goal instituted by Congress, to say, "Go do this, and here are the resources to do it."

So, I didn't mean to imply that there wasn't awesome work being done here, but other countries see that and just work around it.

Mr. GRAVES OF LOUISIANA. It is a great point, and it actually kind of leads me to my next question.

So, do you believe that—the fact that we are being passed up, do you believe that that is a resource issue? An expertise issue? Just too conservative of a standard? Do you have any thoughts there?

Mr. CLARK. Yes. I think that there is a layer between the leadership of the FAA and the people that we work with on a day-to-day basis. They are motivated, excited, working hard on what they are trying to do, without the delegation authority to make a decision. However, right at the top, folks are saying, "Yes, we want to do this."

And as we work through this, we need to provide, like, vertical pressure right down through the FAA to say, "This is a fundamentally safer technology. You have the authority to make a physics-based declaration of what it means to be certified. Now go do it."

Yes, we need expertise, and, again, like I said before, we need to look horizontally into all the other industries that have electrified and say, "That makes sense. The reliability and safety of that is great in locomotive, in automotive, and we are going to move it over to aviation, and we are going to employ that here."

Mr. GRAVES OF LOUISIANA. Anyone else?

I don't want anybody to yell at me about how much time I am taking.

Well, I will ask this in closing. Is there anything that any of you would like to add to your statements or clarify any answers that you gave earlier or anything you haven't been asked that you would like to expand upon?

Mr. BEVIRT. I think we are standing at a really exciting moment, this culmination of so many technologies that are going to fundamentally transform aviation and the lives of people around the world, delivering significant increases in the productivity of our communities as we connect more people in shorter amounts of time.

And this is all standing on the shoulders of more than 100 years of pioneering aviation work here in the U.S. that has made aviation our safest, fastest, and lowest cost mode of transportation.

We are so grateful for the leadership of this committee, of the work, the hard work, day-in and day-out by the teams at the FAA to deliver this remarkably safe aviation ecosystem that we have. And it is really exciting to be seeing the industry embracing these next-generation technologies.

Mr. CLARK. If I may just add something that hasn't been talked about a lot, and that is general aviation.

GA is not separate from commercial aviation. I am speaking as a pilot, a certified flight instructor, an owner of aircraft, and owner of an aerospace business as well. GA is the conduit through which we have set—I just taught my daughter to fly. She is a pilot as well. She learns her basic habits to be a safe pilot for life, as she progresses into commercial aviation, in general aviation.

Many aircraft companies start in general aviation and move into part 25 commuter class. Many people in ATC start at small airports that predominately host GA before they move to the big airports.

We need to focus on GA, we need to foster GA, and we need to allow it to flourish to provide a conduit to our pilot shortage, our maintenance shortage, the people who are developing aircraft.

And, frankly, I actually think we should return the FAA to own the responsibility to promote aviation. We want our best and our brightest in a really important sector of our country. We want to maintain the leadership.

We need to promote, and we need to establish a safe—the FAA does a great job on safety. We need to promote aviation. We need good people in it that are inspired to be there. General aviation is a great place to focus on.

Mr. GRAVES OF LOUISIANA. Thank you.

I am not sure if any of you have been in the rotunda of the Capitol, but up in the rotunda of the Capitol they have a painting called the Frieze of American History that goes all the way around, 360 degrees. And if you look right on the western end, or the western side, they actually have the Wright brothers' plane up there depicted because of its transformative role in United States history. And I think that I am looking right now at the next transformative innovators in our country.

And I am really excited to help, in this next FAA bill, to be able to work together with everyone on this committee, to help to chart

a path that creates the certainty, that creates the predictability that you need, that truly moves at the pace of innovation, as opposed to being this bottleneck or impediment to progress.

The United States, as some of you have noted, we are the gold standard in regard to safety, and we are the gold standard in regard to innovation. And we need to make sure that we do that. We need to make sure that this bill is focused on that next generation of aircraft, on the new entrants into market, that we maintain the balance of safety and innovation moving forward.

And I just want to thank you for being here today and helping to inform us on how we strike the balance. I hope that you are able to continue to share feedback with us on how we can make sure that this bill strikes that right balance.

So, I yield back my time.

And seeing that there are no other Members here to speak, I want to thank you again for your testimony.

And I ask unanimous consent that the record of today's hearing remain open until such time as our witnesses have provided answers to any questions that may be submitted to them in writing.

Without objection, it is so ordered.

I also ask unanimous consent that the record remain open for 15 days for any additional comments and information submitted by Members or witnesses to be included in the record of today's hearing.

Without objection, so ordered.

The subcommittee stands adjourned.

[Whereupon, at 2:24 p.m., the subcommittee was adjourned.]

SUBMISSIONS FOR THE RECORD

Letter and attached 2023 FAA Reauthorization Bill Priorities and Proposals to Hon. Sam Graves, Chairman, and Hon. Rick Larsen, Ranking Member, Committee on Transportation and Infrastructure, and Hon. Garret Graves, Chairman, and Hon. Steve Cohen, Ranking Member, Subcommittee on Aviation, from Michael Robbins, Chief Advocacy Officer, Association for Uncrewed Vehicle Systems International, Submitted for the Record by Hon. Rudy Yakym III

Honorable SAM GRAVES,
*U.S. Representative, Missouri-06,
Chair, House Transportation and Infrastructure Committee, 2165 Rayburn House
Office Building, Washington, DC 20515.*

Honorable RICK LARSEN,
*U.S. Representative, Washington-02,
Ranking Member, House Transportation and Infrastructure Committee, 2164 Ray-
burn House Office Building, Washington, DC 20515.*

Honorable GARRET GRAVES,
*U.S. Representative, Louisiana-06,
Chair, Subcommittee on Aviation, 2165 Rayburn House Office Building, Washington,
DC 20515.*

Honorable STEVE COHEN,
*U.S. Representative, Tennessee-09,
Ranking Member, Subcommittee on Aviation, 2164 Rayburn House Office Building
Washington, DC 20515.*

Re: 2023 Federal Aviation Administration Reauthorization Bill Priorities and Proposals

DEAR CHAIR GRAVES, RANKING MEMBER LARSEN, CHAIR GRAVES, RANKING MEMBER COHEN, AND REMAINING MEMBERS OF THE HOUSE TRANSPORTATION AND INFRASTRUCTURE COMMITTEE,

The Association for Uncrewed Vehicle Systems International (AUVSI) applauds you for continuing to work towards the 2023 Federal Aviation Administration Reauthorization.

AUVSI is the world's largest non-profit organization dedicated to the advancement of uncrewed systems, autonomy, and robotics. We represent corporations and professionals from more than 60 countries that are involved in industry, government, and academia. AUVSI's primary markets span the defense, civil, and commercial industries. Uncrewed systems represent an expansive market within the transportation system, and it is our mission to ensure all types of uncrewed systems, autonomy, and robotics companies that work with us have access to the resources they need to be successful in such a highly competitive industry.

As you conduct your jurisdictional oversight throughout this process, we would encourage you to hold hundreds of exploratory meetings and several hearings across all aviation stakeholders and areas of interest. Specifically, careful care and consideration must be given to the uncrewed aircraft systems (UAS), autonomy, and robotics spaces, which comprise the majority of our expansive, unique, and diverse membership.

We are committed to continuing to be a resource to you throughout this process and welcome any questions you may have on the proposals enclosed below.

Sincerely,

MICHAEL ROBBINS,
Chief Advocacy Officer, AUVSI.

cc: All Members of the House Transportation and Infrastructure Committee

AUVSI
FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES
BEYOND VISUAL LINE OF SIGHT (BVLOS)

Priority 1: Inclusion of the Increasing Competitiveness for American Drones Act of 2023 (S. 307), with the slight modifications discussed in priorities 3 and 4, which was introduced by Sens. Mark Warner (D–VA) and John Thune (R–SD) on February 7, 2023.

Priority 2: While working towards a final BVLOS rulemaking, direct the FAA to issue more immediate guidance, such as standard scenarios or pre-defined risk assessments, providing accelerated pathways to enable low-altitude operations under the current rules within 120 days of enactment. This would include standardizing the process for Part 135 waivers, including sections for which relief should be sought and the supporting information required from applicants, which would accommodate more complex operations into the National Airspace System.

Suggested Language:

SEC. []. LOW ALTITUDE UNMANNED AIRCRAFT SYSTEMS OPERATION
Title 49 U.S.C. Section 44806 is amended by adding the following subsection at the end:

(e) LOW ALTITUDE OPERATION PERMITTED.—

- (1) IN GENERAL.—Not later than 120 days after the date of enactment of this subsection, and notwithstanding the pendency of any other rulemaking proceeding for rules permitting the operation of unmanned aircraft systems commercially beyond the visual line of sight (in this subsection referred to as ‘BVLOS’) of the operator, the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall:
 - (A) Provide accelerated pathways to enable the low-altitude operation of BVLOS unmanned aircraft systems; and
 - (B) Standardize the process for certificate of waivers issued under 14 C.F.R. Part 135 as to accommodate more complex air carrier operations into the National Airspace System.
- (2) GUIDANCE.—For the purpose of carrying out paragraph (1), the Administrator may issue guidance that:
 - (A) Clarifies the minimum evidence and information requirements for standard scenarios covering unmanned aircraft systems commercial BVLOS operations; and
 - (B) Establishes and publishes the operational scenarios for predefined risk assessments to enable the efficient development of procedures that must be contained in the operator manual for commercial BVLOS unmanned aircraft systems.

Priority 3: Mandate quick production of Part 108 drone pilot rules covering varying levels of automation and training necessary, as included in the BVLOS Aviation Rulemaking Committee Report.

Suggested Language:

SEC. []. PART 108 RULES FOR UNMANNED AIRCRAFT SYSTEMS
Chapter 448 of Title 49, United States Code, is amended by adding the following section at the end:

SEC. 44811. NEW PART 108 RULES.—

- (a) IN GENERAL.—Not later than 60 days after the date of enactment of this section, and notwithstanding any other proposed rulemaking establishing a regulatory pathway for certification or approval of unmanned aircraft systems to enable commercial beyond visual line of sight (in this section referred to as ‘BVLOS’) operations, the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall adopt the proposed rules for Part 108 of Title 14, Code of Federal Regulations contained in the final report and recommendations of the Beyond Visual Line of Sight Aviation Rulemaking Committee as submitted to the Administrator on March 10, 2022.

Priority 4: An extension of Title 49 U.S.C. Section 44807 authority, which includes additional clarity from Congress on how Congress intended this authority to work in the first place, and ensures that previous work and testing on 44807 and type certification by companies is incorporated into any new standard the FAA develops for airworthiness.

Suggested Language:

SEC. [] 44807 EXTENSION AND CLARIFICATION

Section 347(a) of the FAA Reauthorization Act of 2018 (Title 49 U.S.C. § 44807) is amended by striking “September 30, 2023” in subsection (d) and inserting “September 30, 2028”.

- (a) IN GENERAL.—Not later than 120 days after the date of enactment of this section the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall adopt the proposed rules that:
- (1) Clarify the intended full authorities of Section 44807 which are meant to provide a pathway to enable advanced operations that can be conducted safely, even when operations take place outside of an existing rule;
 - (2) Recognize that the FAA has narrowly interpreted Section 44807, and therefore, clarification and reinforcement of Congressional intent is necessary;
 - (3) Provide for the issuance of type certificates to qualifying applicants with long-standing type certification applications prior to the FAA establishing a new certification and approval process;
 - (4) Ensure that previous work and testing on Section 44807 and type certification by companies is incorporated into this new standard the FAA develops for airworthiness; and
 - (5) Recognize past and ongoing efforts by UAS operators to act in accordance with previous guidance, anticipating that more efficient and effective frameworks will be implemented.

OVERVIEW

AUVSI has been intimately involved in the FAA’s BVLOS Aviation Rulemaking Committee (ARC) and its processes from day one. Our President and CEO, Brian Wynne, was a member of the ARC, as were many of our member companies. A BVLOS rulemaking will be transformative for the entire drone industry and will allow commercial UAS operations to scale to heights not yet seen before due to an inadequate regulatory environment. Currently, industry innovation is being stifled, as opposed to fostered, due to insufficient regulatory processes and bureaucratic challenges unrelated to safety to enable routine, longer-distance operations BVLOS.

AUVSI requests that Congress directs the FAA to finalize a rulemaking based on the BVLOS ARC Report no later than 6 months after the date of enactment of the Increasing Competitiveness for American Drones Act of 2023 (as part of the FAA Reauthorization bill), as mandated by the legislation itself. It is imperative that there is a clear timeline for expediting UAS BVLOS regulations and/or implementation and mandatory reports to Congress on progress. The FAA must also be held accountable and provide Congress and industry with a rationale for any delays. This must all be done while ensuring that BVLOS operations maintain high levels of air safety.

AUVSI is pleased that the FAA has granted numerous BVLOS waivers enabling low-altitude operations, including those shielded by structures and terrain, and that the FAA informed the Advanced Aviation Advisory Committee (AAAC) in February 2022 that the agency is exploring BVLOS standard scenarios and pre-defined risk assessments to streamline and standardize low-risk, high-value BVLOS approvals. AUVSI requests that Congress mandates the FAA to standardize the process for BVLOS waivers, as it will ensure safety, reduce demand on FAA review resources, and provide more certainty for regulated entities. Therefore, while working on a final BVLOS rule, AUVSI requests that Congress directs the FAA to also issue more immediate guidance, such as standard scenarios or pre-defined risk assessments, providing accelerated pathways to enable low-altitude operations under the current rules within 120 days of enactment. Within that 120-day timeframe, AUVSI also requests that Congress pushes the FAA to standardize the process for Part 135 waivers, which would accommodate more complex UAS operations into the NAS.

Congress should instruct the FAA to permit aircraft with a Title 49 U.S.C. Section 44807 exemption, that have logged a designated number of flight hours, to waive certain elements of type certification. Doing so will immediately unlock a significant number of safe UAS aircraft that have been stuck in an uncertain regulatory status. This will eliminate the current bifurcation of UAS certification and will promote a pathway to developing UAS-specific change management processes. At this time, the FAA has a bifurcated UAS certification processes between standard airworthiness certifications and Section 44807, which is intended to allow the FAA to quickly grant “special” airworthiness certifications for certain UAS. Unfortunately, this du-

plication of effort has not yielded its intended results and instead has created a significant backlog of aircraft stuck in “limbo” between Section 44807 exemptions and a standard airworthiness certification process that is broken. While the FAA works on long term airworthiness solutions, four steps can be taken to provide continuity of operations and certainty to operators, including:

Extend Section 44807 authorities through the duration of the FAA Reauthorization, or until a new framework is implemented.

Clarify the intended full authorities of Section 44807. The current FAA Reauthorization intended to provide a pathway to enable advanced operations that can be conducted safely, even when operations take place outside of an existing rule. However, the FAA has narrowly interpreted Section 44807, and therefore, clarification and reinforcement of Congressional intent is necessary.

Provide for the issuance of type certificates to qualifying applicants with long-standing type certification applications prior to the FAA establishing a new certification and approval process.

Ensure that previous work and testing on Section 44807 and type certification by companies is incorporated into this new standard the FAA develops for airworthiness. While it is anticipated that more efficient and effective frameworks will be implemented, the FAA should recognize past and ongoing efforts by UAS operators to act in accordance with previous guidance.

AUVSI

FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES ADVANCED AIR MOBILITY (AAM)

Priority 1: The Administrator of the FAA shall commence a rulemaking to develop certification standards for both piloted and unpiloted electric vertical take-off and landing aircraft, and other powered-lift AAM and Urban Air Mobility (UAM) aircraft, and shall report to the House Committee on Transportation and Infrastructure and the Senate Committee on Commerce, Science, and Transportation by September 30 of each year on its progress in implementing the rule until such time as it issues a final rule.

Suggested Language:

SEC. []. CERTIFICATION STANDARDS FOR REMOTELY PILOTED AND PILOTED PASSENGER AND CARGO CARRYING POWERED-LIFT AIRCRAFT

- (a) RULEMAKING.—Not later than 6 months after the date of enactment of this Act, the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall issue a Notice of Proposed Rulemaking to establish certification standards for remotely piloted, and piloted, passenger and cargo carrying aircraft and ground control stations and shall issue a final rule within 24 months of the date of enactment of this Act.
- (b) REPORTS.—The Administrator shall provide a written report to the House Committee on Transportation and Infrastructure and the Senate Committee on Commerce, Science, and Transportation 1 year after enactment and periodically on an annual basis thereafter. The reports to the Committees should include status updates on the progress of the rulemaking by the Federal Aviation Administration for the purposes of ensuring robust congressional oversight.

Priority 2: Direct the FAA to complete the Special Federal Aviation Regulation (SFAR) powered-lift rule no later than December 31, 2024, the FAA’s own announced deadline for completion. We also propose that Congress puts in place an interim solution that would allow for powered-lift aircraft to operate commercially under existing regulations if the SFAR’s publishing does not comply with this deadline. This proposed interim path would go away once the final SFAR is issued.

Suggested Language:

SEC. []. RULES AND INTERIM OPERATIONS OF POWERED-LIFT AIRCRAFT

- (a) DEFINITION.—The term powered-lift aircraft means a heavier-than-air aircraft capable of vertical takeoff, vertical landing, and low speed flight that depends principally on engine-driven lift devices or engine thrust for lift during these flight regimes and on nonrotating airfoil(s) for lift during horizontal flight.

- (b) RULEMAKING.—Not later than 1 year after the date of enactment of this Act, and no later than December 31, 2024, the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall promulgate a Powered-Lift Special Federal Aviation Regulation establishing a procedure for certifying pilots and operation of powered-lift aircraft capable of transporting passengers or cargo.
- (c) APPLICATION OF RULES.—Upon enactment of this Act, rules currently in effect that specifically apply to the operation of “rotorcraft” or “helicopters” within Code of Federal Regulations, Title 14, Chapter 1, Subchapter F, G, H, and I, shall be deemed to govern the operation of powered-lift aircraft in the National Airspace System.
- (d) AIRMEN PRIVILEGES.—Upon enactment and upon completion of a Type Rating for a specific powered-lift aircraft, Airmen that hold Pilot or Instructor Certificates with the Ratings listed below shall be deemed to have the privileges of a Powered-Lift Rating for the same Aircraft:
 - (i) Airplane Category in any class; or
 - (ii) Rotorcraft Category in the Helicopter class.
- (e) TERMINATION.—To ensure air transportation operations authorized by this section may continue without interruption upon and after the issuance of the Special Federal Aviation Regulation, the authority in this section shall expire upon the effective date of the Special Federal Aviation Regulation for powered-lift aircraft operations or any rulemakings which satisfy the intent of the sections of this provision.
- (f) SAVINGS CLAUSE.—Notwithstanding any other provision of law, nothing in this section shall be interpreted to limit or otherwise prevent the Administrator or Secretary of Transportation from issuing any necessary approval, Operation Specification, or any other authorization that may be required to operate powered-lift aircraft safely, efficiently, and expeditiously in air transportation operations.

Priority 3: Include a Sense of Congress in support of United States global leadership in UAS and all facets of AAM, including Urban Air Mobility (UAM), Regional Air Mobility (RAM), electric vertical take-off and landing aircraft, electrification, and increasingly autonomous aviation technology in the FAA Reauthorization bill.

Suggested Language:

SEC. []. SENSE OF CONGRESS ON ADVANCED AIR MOBILITY

Whereas Unmanned Aircraft Systems and specifically Advanced Air Mobility represent a key area of sustainable transportation and economic growth for the United States;

Whereas Advanced Air Mobility is an exciting new part of the aviation ecosystem;

Whereas Advanced Air Mobility is the overarching concept under which Urban Air Mobility and Regional Air Mobility reside;

Whereas Urban Air Mobility and Regional Air Mobility will help connect both urban and rural populations to each other and to the rest of the nation, as well as move freight, regardless of geographic locations and proximity to a travel hub or urban center;

Whereas for the benefits of Advanced Air Mobility to be more broadly realized, there should be a clear and stable process with clear timeframes for Advanced Air Mobility certification and operationalization;

Whereas our domestic Advanced Air Mobility industry will fail to launch without a more palatable regulatory atmosphere for certification and operations;

Whereas Europe, China, and other competitors will fill the void and dominate the global market for manufacturing and development of Advanced Air Mobility technologies;

Whereas autonomy is a key area in which the United States should be racing ahead, but continues to fall behind due to regulatory issues;

Whereas the Federal Aviation Administration does not have the personnel and expertise necessary to certify these new aircraft within a timeframe that aligns with industry needs and for the United States to maintain global leadership; and

Whereas the Federal Aviation Administration needs more funding to hire additional personnel as significant resources are needed to work through the certification process that is already underway for multiple applicants.

Resolved, that it is the Sense of Congress that—

- (1) The United States must continue to maintain its global leadership in all facets of Advanced Air Mobility, including Urban Air Mobility, Regional Air Mobility, Electric Vertical Take-Off and Landing aircraft, electrification, and other forms of increasingly autonomous aviation technology;
- (2) The Federal Government must continue to foster leadership, inter-agency collaboration, and collaboration with industry in the adoption and deployment of Advanced Air Mobility; and
- (3) The United States will cede leadership in this space to other nations without imminent regulatory changes.

Priority 4: Ensure the FAA provides clear timelines to enable operationalization of AAM and that reports to Congress and industry on AAM certification and operationalization be mandated by law.

Suggested Language:

SEC. []. TIMELINES TO ENABLE OPERATIONALIZATION OF ADVANCED AIR MOBILITY

(a) RULEMAKING.—

- (1) IN GENERAL.—Not later than 180 days after the date of the enactment of this section, the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’) shall adopt rules in the proceeding initiated in the Notice of Proposed Rulemaking in the matter of Update to Air Carrier Definitions (Docket No. FAA–2022–1563; Notice No. 23–03) in accordance with paragraph (2).
- (2) UPDATES REQUIRED.—In the rules adopted under paragraph (1), the Administrator shall provide clear timelines to enable operationalization of Advanced Air Mobility certification.
- (3) REPORT TO CONGRESS.—Not later than 180 days following the adoption of the rules under paragraph (1), the Administrator shall prepare and submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report on Advanced Air Mobility certification and operationalization.

OVERVIEW

AAM is an exciting new part of the aviation ecosystem, which we view as the overarching concept under which Regional Air Mobility (RAM) and Urban Air Mobility (UAM) reside. RAM and UAM will help connect both urban and rural populations to each other and to the rest of the nation, as well as move freight, regardless of geographic locations. According to the National Aeronautics and Space Administration (NASA), RAM, “seeks to fundamentally change how we travel by bringing the convenience, speed, and safety of air travel to all Americans, regardless of their proximity to a travel hub or urban center.”

For the benefits of AAM to be more broadly realized, there should be a clear and stable process with clear timeframes for AAM certification. Without this, our domestic AAM industry will fail to launch. Europe, China, and other competitors will fill the void and dominate the global market for manufacturing and development of these technologies. In order for the AAM industries to operate at scale, the FAA will need to certify these new aircraft platforms in a timely manner to ensure they are airworthy and safe for operations.

The FAA does not have the personnel and expertise necessary to certify these new aircraft within a timeframe that aligns with industry needs and for the United States to maintain global leadership. The FAA needs more funding to hire additional personnel. Significant resources are needed to work through the certification process that is already underway for multiple applicants.

AUVSI has heard from our members and from the FAA directly that the agency is working hard and performing significant work to get projects through the process. AUVSI agrees with that sentiment. However, the FAA will need more resources moving forward, as there will be a growing backlog of applications and competition for limited resources among competitive aviation technologies. This backlog will be caused by an uptick in certification applications, which are expected to significantly increase over the next five to 10 years as new companies enter the market. There-

fore, each of the aforementioned priorities is critical to ensuring the industry is able to scale to heights not seen before.

The FAA is actively working on the “Powered-Lift” Special Federal Aviation Regulation (SFAR) which would put in place the commercial operations and pilot licensing path for electric vertical take-off and landing vehicles’ (eVTOL) entry into service. This gating rulemaking for day one operations is necessary due to the new certification path utilizing Part 21.17(B) Special Class Powered-Lift. We appreciate the bipartisan Congressional oversight of the FAA to ensure that the SFAR is completed in line with the FAA’s stated deadline of December 31, 2024, to meet industry timelines for commercial operations. Because of the importance of the SFAR, it is imperative that Congress continues to provide strong oversight of the FAA to ensure the process is completed on time, as well as create an interim policy that would enable early commercial operations if the FAA should miss this deadline, or a company achieves type certification prior to rule completion.

AUVSI
FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES
SPECTRUM & DATA

SPECTRUM

Priority: Include language around spectrum, notably to avoid another situation like the recent 5G rollout and interference. Such language on spectrum should include government coordination, command and control (C2) link requirements (including FCC 5030–5091 MHz rulemaking), and more. Rules must be adopted to ensure UAS have access to dedicated, licensed spectrum, such as the proposed 5030–5091 MHz band (the “C-band”).

Suggested Language:

SEC. []. RULEMAKING ON UNMANNED AIRCRAFT SYSTEMS SPECTRUM

(a) RULEMAKING.—

- (1) IN GENERAL.—Not later than 270 days after the date of enactment of this section, the Federal Communications Commission (in this section referred to as the ‘Commission’) shall adopt rules in the proceeding initiated in the Notice of Proposed Rulemaking in the matter of Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems (WT Docket No. 22–323; FCC 22–101) to promote access by unmanned aircraft systems operators to licensed spectrum in the 5030–5091-Megahertz band in accordance with paragraph (2).
- (2) REQUIREMENTS.—The final rules adopted under paragraph (1) shall:
 - (A) Enable unmanned aircraft systems operators to reliably access licensed spectrum in the 5030–5091-Megahertz band necessary to support safety-critical unmanned aircraft systems command-and-control communications links; and
 - (B) Ensure co-existence of terrestrial mobile operations and unmanned aircraft systems operators without harmful interference.
- (b) INTERAGENCY COORDINATION.—In promulgating rules under subsection (a), the Commission shall consult with the Federal Aviation Administration and the National Telecommunications Information Administration to:
 - (1) Ensure compliance with applicable Federal Aviation Administration remote pilot regulations by unmanned aircraft systems operators seeking to access licensed spectrum in the 5030–5091-Megahertz band; and
 - (2) Avoid harmful interference amongst licensed users of the 5030–5091-Megahertz band and with any other user of terrestrial mobile operations in the adjacent bands.
- (c) ALLOCATION OF ADDITIONAL SPECTRUM FOR UNMANNED AIRCRAFT SYSTEMS OPERATIONS.—Not later than 1 year after the date of enactment of this section, the Commission shall issue a Notice of Inquiry to provide a comprehensive examination of the spectrum needs of unmanned aircraft systems operations and identify additional flexible-use spectrum bands that may be suitable for use by or licensing to unmanned aircraft systems operators, taking into account the airborne nature of such spectrum usage. Rules for any frequency should be performance-based, and priority should be given to providing widespread and flexible use by unmanned aircraft systems operators to ensure options are available that are suitable for the wide variation in unmanned aircraft systems applications.

OVERVIEW

Spectrum needs for both civil and military aviation continue to be an issue. We have repeatedly seen issues within the FAA related to spectrum, notably the 5G meltdown in 2021. There are several efforts underway to open up certain spectrum for use by UAS, which is the product of industry collaboration with the FAA and Federal Communications Commission (FCC), as well as collaboration amongst the two regulators. The FCC just issued two notices critical to UAS and spectrum. It is our goal to ensure that the FAA's Spectrum Engineering & Policy Office has the resources they need to accommodate the UAS and Advanced Air Mobility (AAM) industries.

The FCC put out its long-awaited Notice of Proposed Rulemaking (NPRM) on the proposed C-band rules for drone command and control (C2). Simply put, the C-band has long been allocated for UAS use, but has no existing service/licensing rules. The Aerospace Industries Association (AIA), an industry group, filed a petition for rulemaking to establish service and licensing rules for the band. On September 7, 2022, the FCC Chairwoman put an NPRM on this issue on circulation. The NPRM also covers other UAS-related spectrum issues.

Additionally, the FCC released its Seventh Report and Order (R&O) and Ninth Further Notice of Proposed Rulemaking (FNPRM) in a proceeding about the 4.9 GHz band. This spectrum band has long been allocated for public safety but is underutilized, and the FCC has been considering moving to a nationwide band manager framework for the band and allowing non-public safety entities to lease spectrum in the band to maximize its usage. In the Eighth FNPRM in this proceeding, the FCC sought comment on allowing aeronautical mobile use in the band, but expressly excluded UAS from that proposal. Excluding UAS from the proposal was consistent with language in the Sixth FNPRM, where the FCC said it would be "premature" to permit UAS usage of the band for a variety of reasons, including the limitations in Part 107 as it existed in March 2018, and the lack of service rules for UAS in any other spectrum band. In the current Seventh R&O and Ninth FNPRM, the FCC has decided to designate a Band Manager for the band and to allow leasing of unused 4.9 GHz spectrum to non-public safety entities. This development has also prompted the FCC to reconsider its prior conclusions against UAS use in the band.

DATA

Priority: Direct the FAA to develop processes and procedures to permit the release of primary and secondary surveillance radar data to trusted United States agents for management and redistribution.

Suggested Language:

SEC. []. SECURE ACCESS TO NATIONAL AIRSPACE SYSTEM DATA

- (a) IN GENERAL.—Not later than 90 days after the date of enactment of this Act, the Administrator of the Federal Aviation Administration (in this section referred to as the 'Administrator') shall initiate a review of all programs, policies, and guidance regarding secure access to National Airspace System data by industry and non-federal entities, including access to real-time primary surveillance radar data, for the purposes of advancing aviation safety and developing detect and avoid capabilities for existing and new aviation users.
- (b) CONTENTS.—The review shall:
 - (1) Evaluate the Federal Aviation Administration's collaboration with inter-agency partners, including the Department of Defense on non-federal access to National Airspace System data for those entities that do not have access under existing programs, and identify specific impediments to secure data access;
 - (2) Review existing demonstration projects involving access to National Airspace System data by non-federal entities;
 - (3) Identify or create project plans and a process for consultation with non-federal stakeholders, including an estimate of the date the demonstration projects will be completed; and
 - (4) Identify technical and administrative limitations, create a project plan, and identify additional resources necessary for the Administrator to provide qualified non-federal entities with real-time access to National Airspace System data, including primary surveillance radar data from existing assets.
- (c) REPORT.—Not later than 270 days after the date of enactment of this section, the Administrator shall submit to the appropriate Committees in

- Congress a report on the results of the review required under subsection (a).
- (1) The assessment developed under this subsection shall be unclassified but may contain a classified annex.
 - (d) IMPLEMENTATION PLAN.—Not later than 1 year after the date of enactment of this Act, the Administrator shall create an implementation plan for secure non-federal access to National Airspace System data. The implementation plan shall include:
 - (1) A streamlined process for applicants to request secure access to real-time primary surveillance radar data for specific geographic areas;
 - (2) The data security processes and protocols that applicants must adhere to when accessing, using, storing, and distributing real-time primary surveillance radar data; and
 - (3) The process for managing any limitations on access to real-time primary surveillance radar data that may be imposed on the Administrator by interagency partners.
 - (e) The Administrator shall task the Advanced Aviation Advisory Committee with developing recommendations to enable and incentivize two-way sharing of primary radar data and other types of National Airspace System data between developers, operators, third-party service providers, and the Federal Aviation Administration to enhance radar coverage by incentivizing non-federal entities to participate in data sharing arrangements.
 - (1) Not more than 180 days after being tasked, the Advanced Aviation Advisory Committee shall deliver a report to the Administrator containing recommendations on the regulatory changes, policies, technologies, guidance, and incentives necessary to enable two-way data sharing and improved radar surveillance converge as described in subsection (e).
 - (f) The Administrator shall develop functional and performance requirements to enhance the Traffic Information Service-Broadcast to support detect and avoid functions in the National Airspace System.
 - (1) Not more than 90 days after being tasked, the Federal Aviation Administration shall develop a plan to engage with non-federal stakeholders, nonprofit associations, and other relevant stakeholders in carrying out the tasks identified in subparagraph (f).
 - (2) The plan shall include development of a prototype of a Traffic Information Service-Broadcast capability that enables detect and avoid for aircraft equipped with Automatic Dependent Surveillance-Broadcast in equipment.
 - (3) Not more than 270 days after being tasked, the Federal Aviation Administration shall develop a report on the functional, performance, and integration requirements for ground-based primary surveillance radar to support collision avoidance.

OVERVIEW

The National Airspace System (NAS) lacks infrastructure that would enable the industry to safely conduct higher risk missions and increase airspace density. AUVSI believes more emphasis needs to be placed on this problem. The FAA also needs to share its robust surveillance datasets as generated by NAS assets, including federal radars, which would better inform the autonomy industry and various types of uncrewed operations moving forward. Congress must put pressure on the FAA to share critical surveillance data, in addition to other robust data sets.

AUVSI requests that Congress directs the FAA to develop processes and procedures to permit the real time release of primary and secondary surveillance radar data to trusted United States agents for management and redistribution. The FAA has extensive radar coverage throughout the United States, all of which is taxpayer funded, and provide a substantial layer of safety for large Part 23 uncrewed systems flying at medium to high altitudes. The FAA should include processes to identify and filter out all national security sensitive operations, while providing data to qualified public and civil operators of large UAS in the NAS.

AUVSI
FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES
FEDERAL AIRSPACE PREEMPTION

Priority: Clarify that the FAA is the sole regulator of matters pertaining to aviation safety, including the use of the airspace at all altitudes and the categorization of drones as aircraft.

Suggested Language:

SEC. []. FEDERAL AIRSPACE PREEMPTION

Alternative 1:

Amend 49 U.S.C. Chapter 448 by adding at the end the following new section:

§ 44811 PREEMPTION OF STATE AND LOCAL LAWS.—No state or political subdivision of a State may adopt, maintain, enforce, prescribe, or continue in effect any law, regulation, rule, standard, requirement, or other provision having the force and effect of law of any State or political subdivision of a State pertaining to:

- (a) Aviation safety at all altitudes of airspace;
- (b) Air navigation at all altitudes of airspace; or
- (c) Categorization of unmanned aircraft systems

that is covered by the provisions of this subpart, or rule, regulation, or requirement promulgated under this subpart.

Alternative 2:

Amend 49 U.S.C. § 40103(b) by adding at the end a new paragraph:

(5) For the purposes of carrying out paragraph (2), the Administrator of the Federal Aviation Administration shall be the sole entity prescribing air traffic regulations pertaining to aviation safety and air navigation at all altitudes of airspace and for all categorization of unmanned aircraft systems under this section. No state or political subdivision of a State may adopt, maintain, enforce, prescribe, or continue in effect any law, regulation, rule, standard, requirement, or other provision having the force and effect of law of any State or political subdivision of a State covered by the provisions of this section, or a rule regulation, or requirement promulgated under this section.

OVERVIEW

AUVSI has long advocated that FAA's occupation of the fields of air navigation and aviation safety preempts attempts by states and localities to exert control over the airspace and regulate operational aspects of the drone industry. In this advocacy, we have explained that federal control over flight operations is necessary for aviation safety given that the airspace is a unique resource that demands centralized federal control. This is something that courts have long recognized in the context of manned aviation. It is no less true in the uncrewed context, as the FAA explained in its 2015 Fact Sheet:

“Substantial air safety issues are raised when state or local governments attempt to regulate the operation or flight of aircraft. If one or two municipalities enacted ordinances regulating UAS in the navigable airspace and a significant number of municipalities followed suit, fractionalized control of the navigable airspace could result with the potential for conflicting or incompatible requirements for UAS and manned aircraft in low altitudes and/or at the boundaries of a local jurisdiction. Additionally, this ‘patchwork quilt’ of differing restrictions could severely limit the flexibility of FAA in controlling the airspace and flight patterns and ensuring safety and an efficient air traffic flow of all types. A navigable airspace free from overreaching state and local restrictions is essential to the maintenance of a safe and sound air transportation system.”

This is also consistent with the position that the FAA has taken elsewhere. For example, when discussing the scope of its authority with the Government Accountability Office (GAO), the FAA noted that it “is responsible for air safety ‘from the ground up,’ including with respect to UAS operations,” and that this “authority and responsibility to regulate all aircraft operations down to the ground is based in part on 49 U.S.C. Section 40103(b)(1),” which is derived from the original assertion of Congressional authority in 1928. Similarly, in pursuing enforcement against dangerous uses of drones, the agency has consistently viewed its responsibility as covering all UAS operations, no matter the altitude.

While we believe that the FAA has the requisite authority today to ensure that UAS operations can continue and expand safely under federal regulation without

undue intrusion from state and local regulators, courts have expressed some confusion about the proper scope of preemption when it comes to uncrewed aircraft and have reached seemingly inconsistent results. The GAO report itself also highlights that other stakeholders may not always agree about the degree to which the FAA's rules are preemptive. Additional clarity from Congress stating that the FAA is the sole authority to regulate UAS at all altitudes will be critical as these debates continue.

AUVSI
FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES
U.S. COMPETITIVENESS

Priority 1: Enact the Drone Infrastructure Inspection Grant (DIIG) Act (S. 4744 and H.R. 5315) from the 117th Congress. 118th Congress House and Senate versions of the DIIG Act are expected to be introduced imminently.

AUVSI has long advocated that the DIIG Act be enacted into law. The common-sense legislation would enhance United States competitiveness by spurring investment in the United States drone industry and worker training, and also provides tangible benefits for infrastructure inspection.

Priority 2: Require the FAA to reverse its policy that prohibits both manned and unmanned aircraft flights over the High Seas, or beyond the United States 12 nautical mile territorial boundary.

There is a need for clarity on the FAA's policy related to authorization of United States-registered UAS (and all aircraft) for operations in airspace over the High Seas (i.e., International Airspace). For the United States to maintain its leadership role in the global effort to integrate UAS into the global aviation ecosystem, it is important that the FAA work with industry to define a path by which UAS with a Special Airworthiness Certificate can be authorized to fly in United States Flight Information Regions beyond 12 nautical miles.

Suggested Language:

Alternative 1:

SEC. []. OPERATIONS OVER THE HIGH SEAS

- (a) IN GENERAL.—Within 180 days of enactment of this Act, the Administrator of the Federal Aviation Administration, in coordination with industry, shall create an operational approval process to allow small unmanned aircraft systems, or unmanned aircraft systems with a special airworthiness certificate, flight over the High Seas within Flight Information Regions managed by the United States.

Alternative 2:

SEC. []. OPERATIONS OVER THE HIGH SEAS

- (a) IN GENERAL.—Within 90 days of enactment of this Act, the Administrator of the Federal Aviation Administration (in this section referred to as the 'Administrator'), in coordination with industry, shall establish an expert group to evaluate applicable International Civil Aviation Organization Annexes and documents concerning unmanned aircraft systems flights entering and exiting the High Seas within the United States Flight Information Regions. Within 90 days of the expert group convening, the Administrator shall submit a report to Congress describing a pathway for approving unmanned aircraft systems operations that commence from the United States National Airspace System, operate and remain over the High Seas within Flight Information Regions managed by the United States, and then return to land within the United States National Airspace System.

Priority 3: Support for domestic UAS companies.

Domestic UAS manufacturers have struggled to compete against foreign subsidized competition, which holds back the availability of United States-made UAS and harms the potential for workforce growth and investment.

Accordingly, the United States Government must foster a more competitive and fair playing field for domestic, United States-based manufacturers. Investing in and expanding new manufacturing capabilities and our workforce will require infrastructure and capital expenditures. Providing tax incentives, grant programs, and other mechanisms to spur that spending would accelerate growth and development that would have otherwise been delayed or denied. Manufacturers tax credits for the production and sale of certain UAS equipment produced and sold in the United States would be a huge benefit to the industry and its competitiveness and would decrease a reliance on UAS from foreign nations, notably China.

In addition to the language below, AUVSI requests that Congress creates a tax incentive program for UAS manufacturing modeled after the Solar Energy Manufacturing for America (SEMA) Act, or modeled after language included in the House's Bioeconomy Research and Development Act of 2021, the America Creating Opportunities for Manufacturing, Pre-Eminence in Technology and Economic Strength (COMPETES) Act of 2022, and the Senate's United States Innovation and Competition Act (USICA) on semiconductors and other technologies. This should be created in coordination with the House Ways and Means Committee for ultimate inclusion in the tax title that they produce for the FAA Reauthorization.

Suggested Language:

SEC. []. ENSURING UNMANNED AIRCRAFT SYSTEMS COMPETITIVENESS ACT OF 2023

- (a) SHORT TITLE.—This section may be cited as the “Ensuring Unmanned Aircraft Systems Competitiveness Act of 2023”.
- (b) FINDINGS.—The Congress makes the following findings:
- (c) DEFINITIONS.—In this section:
 - (1) Unmanned Aircraft Systems or UAS.—The term “Unmanned Aircraft Systems” or ‘UAS’ has the meaning given the term ‘unmanned aircraft system’ in section 44801 of title 49, United States Code.
 - (2) Initiative.—The term “Initiative” means the National UAS Manufacturing Competitiveness Initiative established under subsection (d).
- (d) NATIONAL UAS MANUFACTURING COMPETITIVENESS INITIATIVE
 - (1) IN GENERAL.—The President, acting through the Office of Science and Technology Policy, shall implement a National UAS Competitiveness Initiative to advance societal well-being, national security, sustainability, and economic productivity and competitiveness of the UAS industry through:
 - (A) Advancing areas of research regarding manufacturing of UAS to accelerate technological innovation, and domestic competitiveness, in the design, production, application, and services of UAS;
 - (B) Supporting research and development of novel tools and technologies to address UAS navigation and communication, including traffic and obstacle detection by UAS, all in an effort to increase competitiveness;
 - (C) Advancing areas of research for batteries used by UAS to optimize, scale, and deliver new products and solutions;
 - (D) Supporting social and behavioral sciences and economics research that advances the field of UAS manufacturing and contributes to the development and public understanding of new UAS products, technologies, applications, and services;
 - (E) Accelerating the translation and commercialization of UAS research and development and competitiveness by the private sector;
 - (F) Improving the interagency planning and coordination of Federal Government activities related to UAS; and
 - (G) Identifying specific ways the Federal Government can help better foster UAS technology and integration into our National Airspace System, given that the technology is here, and industry is ready to operate in a more meaningful way, now.
 - (2) INITIATIVE ACTIVITIES.—The activities of the Initiative shall include:
 - (A) Sustained support for UAS manufacturing competitiveness through:
 - (i) Grant funding to individual researchers and teams of individuals;
 - (ii) Projects funded under joint solicitations by a collaboration of no fewer than two Agencies participating in the Initiative; and
 - (iii) Interdisciplinary research and UAS competitiveness centers that are organized to carry out technology development and demonstration activities.
 - (B) Sustained support for the development, optimization, and validation of novel tools and technologies to enable the dynamic application of UAS in the field of agriculture, military, aerospace, entertainment, and security, including through:
 - (i) Research conducted at Federal laboratories;
 - (ii) Grants to fund the work of researchers at institutions of higher education and other nonprofit research institutions; and
 - (iii) Awards under the Small Business Innovation Research and Small Business Technology Transfer Programs, as described in section 9 of the Small Business Act (15 U.S.C. 638).

- (C) Activities to develop robust mechanisms for documenting and quantifying the outputs and economic benefits of UAS manufacturing;
- (D) Activities to accelerate the translation and commercialization of new products, applications, and technologies by:
 - (i) Identifying precompetitive research opportunities;
 - (ii) Facilitating public-private partnerships in UAS research and development to spur competitiveness;
 - (iii) Connecting researchers, graduate students, and postdoctoral fellows with entrepreneurship education and training opportunities; and
 - (iv) Supporting proof of concept activities and the formation of startup companies including through programs such as the Small Business Innovation Research and Small Business Technology Transfer Programs.
- (H) Foster better integration of UAS technologies into our National Airspace System and ensure those already operating can do so in a more meaningful way.
- (3) EXPANDING PARTICIPATION.—The Initiative shall include, to the maximum extent practicable, outreach to primarily undergraduate and minority-serving institutions (and institutions of higher education with an established STEM capacity building program focused on traditionally underrepresented populations in STEM, including Native Hawaiians, Alaska Natives, and Tribal Nations) about Initiative opportunities, and shall encourage the development of research collaborations between research-intensive universities and primarily undergraduate and minority-serving institutions (and institutions of higher education with an established STEM capacity building program focused on traditionally underrepresented populations in STEM, including Native Hawaiians, Alaska Natives, and Tribal Nations).
- (4) ESTABLISH UNMANNED AIRCRAFT SYSTEMS TECHNOLOGY PRIORITY.—Pursuant to this Initiative, all Agencies involved must give priority to small business concerns that participate in or conduct research and development relating to UAS technologies and their competitiveness, UAS manufacturing processes, UAS component production, UAS aircraft production, or UAS workforce skills and protection. The Small Business Administration's Small Business Innovation Research and Small Business Technology Transfer Programs should take a leading role in this effort. Each Agency must include in its Annual Report to the Small Business Administration a synopsis of its implementation of these requirements. All Agencies involved in this Initiative must assess their needs keeping tangible numbers of solicitation topics, awards, and dollars in mind. Mechanisms commonly used by Agencies to give priority to UAS-related work include:
 - (A) Adding UAS-related topics in solicitations;
 - (B) Requesting in solicitations that proposals address any possible UAS-related elements of the small businesses' proposed work, technological approach, delivery, or resulting technological applicability to the UAS development processes; and
 - (C) Noting in solicitations that including such elements in proposals may provide a competitive advantage in the award selection process.

Additionally, cross-Agency collaborations, targeted outreach efforts, and other Agency specific activities related to UAS development contribute to addressing the objectives of the Initiative and should be prioritized.
- (5) ETHICAL, LEGAL, ENVIRONMENTAL, SAFETY, SECURITY, AND SOCIETAL ISSUES.—Initiative activities shall take into account ethical, legal, environmental, safety, security, and other appropriate societal issues by:
 - (A) Supporting research, including in the social sciences, and other activities addressing ethical, legal, environmental, and other appropriate societal issues related to UAS manufacturing and adoption;
 - (B) Supporting research and other activities related to the safety and security implications of UAS;
 - (C) Ensuring that input from Federal and non-Federal experts on the ethical, legal, environmental, safety, security, and other appropriate societal issues related to UAS adoption is integrated into the Initiative;
 - (D) Ensuring, through the Agencies and departments that participate in the Initiative, that public input and outreach are integrated into the

Initiative by the convening of regular and ongoing public discussions through mechanisms such as workshops, consensus conferences, and educational events, as appropriate; and

- (E) Complying with all applicable provisions of Federal law.
- (e) INITIATIVE COORDINATION.—
- (1) INTERAGENCY COMMITTEE.—The President, acting through the Office of Science and Technology Policy, shall designate an Interagency Committee to coordinate activities of the Initiative as appropriate, which shall be co-chaired by the Office of Science and Technology Policy, and include representatives from the National Science Foundation, the Federal Aviation Administration, the Federal Communications Commission, the Department of Defense, the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the National Institute of Standards and Technology, the Environmental Protection Agency, the Department of Agriculture, the Department of Health and Human Services, the Bureau of Economic Analysis, and any other agency that the President considers appropriate (in this section referred to as the Interagency Committee). The Director of the Office of Science and Technology Policy shall select an additional co-chairperson from the members of the Interagency Committee. The Interagency Committee shall oversee the planning, management, and coordination of the Initiative. The Interagency Committee shall:
 - (A) Provide for interagency coordination of Federal UAS manufacturing research, development, and other activities undertaken pursuant to the Initiative;
 - (B) Establish and periodically update goals and priorities for the Initiative;
 - (C) Develop, not later than 12 months after the date of the enactment of this section, and update every 3 years thereafter, a strategic plan submitted to the Committee on Science, Space, and Technology and the Committee on Energy and Commerce of the House of Representatives and the Committee on Commerce, Science, and Transportation and the Committee on Health, Education, Labor, and Pensions of the Senate that:
 - (i) Guides the activities of the Initiative for the purposes of meeting the goals and priorities established under (and updated pursuant to) subparagraph (B); and
 - (ii) Describes:
 - (I) The Initiative’s support for long-term funding for UAS manufacturing research and development and competitiveness;
 - (II) The Initiative’s support for education and public outreach activities;
 - (III) The Initiative’s support for research and other activities on ethical, legal, environmental, safety, security, and other appropriate societal issues related to UAS;
 - (IV) How the Initiative will contribute to moving results out of the laboratory and into application for the benefit of society and United States competitiveness; and
 - (V) How the Initiative will measure and track the contributions of UAS to United States economic growth and other societal indicator.
 - (D) Develop a plan to utilize Federal programs, such as the Small Business Innovation Research and Small Business Technology Transfer Programs as described in section 9 of the Small Business Act (15 U.S.C. 638), in support of the activities described in subsection (d)(2)(B);
 - (E) In carrying out this subsection, take into consideration the recommendations of the Advisory Committee established under subsection (f), the results of the workshop convened under subsection (d)(4)(D), existing reports on related topics, and the views of academic, State, industry, and other appropriate groups; and
 - (F) Ensure better integration of UAS technologies into our National Airspace System and work with those in industry already operating to better understand changes the Federal Aviation Administration needs to make to allow them to do so in a more meaningful way.
 - (2) TRIENNIAL REPORT.—Beginning with fiscal year 2023 and ending in fiscal year 2029, not later than 90 days after submission of the President’s annual budget request and every third fiscal year thereafter, the

Interagency Committee shall prepare and submit to the Committee on Transportation and Infrastructure of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate a report that includes:

- (A) A summarized Agency budget in support of the Initiative for the fiscal year to which such budget request applies, for the following 2 fiscal years, for the then current fiscal year, including a breakout of spending for each Agency participating in the Program, and for the development and acquisition of any research facilities and instrumentation; and
 - (B) An assessment of how Federal Agencies are implementing the plan described in paragraph (1)(C), including:
 - (i) A description of the amount and number of awards made under the Small Business Innovation Research Program and Small Business Technology Transfer Programs (as described in section 9 of the Small Business Act (15 U.S.C. 638)) in support of the Initiative;
 - (ii) A description of the amount and number of projects funded under joint solicitations by a collaboration of no fewer than 2 Agencies participating in the Initiative; and
 - (iii) A description of the effect of the newly funded projects by the Initiative.
- (3) INITIATIVE OFFICE.—
- (A) IN GENERAL.—The President shall establish an Initiative Coordination Office, with a Director and full-time staff, which shall:
 - (i) Provide technical and administrative support to the Interagency Committee and the Advisory Committee established under subsection (f);
 - (ii) Serve as the point of contact on Federal UAS manufacturing competitiveness activities for government organizations, academia, industry, professional societies, State governments, interested citizen groups, and others to exchange technical and programmatic information;
 - (iii) Oversee interagency coordination of the Initiative, including by encouraging and supporting joint agency solicitation and selection of applications for funding of activities under the Initiative, as appropriate;
 - (iv) Conduct public outreach, including dissemination of findings and recommendations of the Advisory Committee established under subsection (f), as appropriate;
 - (v) Serve as the coordinator of ethical, legal, environmental, safety, security, and other appropriate societal input; and
 - (vi) Promote access to, and early application of, the technologies, innovations, and expertise derived from Initiative activities to agency missions and systems across the Federal Government, and to United States industry, including startup companies.
 - (B) FUNDING.—The Director of the Office of Science and Technology Policy, in coordination with each participating Federal department and Agency, as appropriate, shall develop and annually update an estimate of the funds necessary to carry out the activities of the Initiative Coordination Office and submit such estimate with an agreed summary of contributions from each agency to Congress as part of the President's annual budget request to Congress.
 - (C) TERMINATION.—The Initiative Coordination Office established under this paragraph shall terminate on the date that is 10 years after the date of the enactment of this section.
- (4) RULE OF CONSTRUCTION.—Nothing in this subsection shall be construed to alter the policies, processes, or practices of individual Federal Agencies in effect on the day before the date of the enactment of this division relating to the conduct of UAS research and advanced development and competitiveness.
- (f) ADVISORY COMMITTEE.—
- (1) IN GENERAL.—The agency co-chair of the Interagency Committee established in subsection (e) shall, in consultation with the Office of Science and Technology Policy, designate or establish an Advisory Committee on UAS manufacturing competitiveness (in this subsection referred to as the Advisory Committee) to be composed of not fewer than 12 members, including representatives of industry, research and aca-

- demographic institutions, and nongovernmental entities, who are qualified to provide advice on the Initiative.
- (2) ASSESSMENT.—The Advisory Committee shall assess:
- (A) The current state of United States competitiveness in UAS manufacturing, including the scope and scale of United States investments in UAS manufacturing research and development and competitiveness in the international context;
 - (B) Current market barriers to commercialization of UAS manufacturing products, processes, and tools in the United States;
 - (C) Progress made in implementing the Initiative;
 - (D) The need to revise the Initiative;
 - (E) The balance of activities and funding across the Initiative;
 - (F) Whether the strategic plan developed or updated by the Interagency Committee established under subsection (e) is helping to maintain United States leadership in UAS manufacturing;
 - (G) The management, coordination, implementation, and activities of the Initiative;
 - (H) Whether ethical, legal, environmental, safety, security, and other appropriate societal issues are adequately addressed by the Initiative; and
 - (I) Identify issues with the Federal Aviation Administration’s approach to regulating UAS integration into the National Airspace System, and identify ways to ensure those already operating can do so in a more meaningful way.
- (3) REPORTS.—Beginning not later than 2 years after the date of enactment of this division, and not less frequently than once every 3 years thereafter, the Advisory Committee shall submit to the President, and the appropriate Committees in Congress, a report on:
- (A) The findings of the Advisory Committee’s assessment under paragraph (2); and
 - (B) The Advisory Committee’s recommendations for ways to improve the Initiative.
- (4) APPLICATION OF FEDERAL ADVISORY COMMITTEE ACT.—Section 14 of the Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the Advisory Committee.
- (5) TERMINATION.—The Advisory Committee established under paragraph (1) shall terminate on the date that is 10 years after the date of the enactment of this Act.
- (g) RULE OF CONSTRUCTION.—Nothing in this section shall be construed to require public disclosure of information that is exempt from mandatory disclosure under section 552 of title 5, United States Code.

Priority 4: Enactment of the Securing American Mineral Supply Chains Act.

When we ask domestic UAS manufacturers how to level the playing field (specifically with manufacturers that are subsidized by their country’s governments, like DJI), one of the issues that has been raised by a number of them is access to rare earth driven components.

AUVSI encourages the enactment of the Securing American Mineral Supply Chains Act (H.R. 8981) from the 117th Congress. It would be highly beneficial to the UAS industry as the legislation would ensure the availability of critical materials that support the manufacturing process of UAS and their components.

AUVSI
FEDERAL AVIATION ADMINISTRATION REAUTHORIZATION PRIORITIES
UAS TRAFFIC MANAGEMENT (UTM) & REMOTE IDENTIFICATION (REMOTE ID)

Priority: AUVSI requests that Congress ensures the FAA accepts ASTM International’s Standard Specification for UTM UAS Service Supplier (USS) Interoperability. Additionally, AUVSI urges Congress to ensure the FAA accepts other industry standards, including those from RTCA SC-228. FAA acceptance of industry consensus standards will significantly benefit the UAS and Advanced Air Mobility and related industries in the U.S.

Suggested Language:

SEC. []. UNMANNED AIRCRAFT SYSTEMS TRAFFIC MANAGEMENT IMPLEMENTATION

- (a) SENSE OF CONGRESS.—It is the sense of Congress that the FAA has failed to both timely and fully implement the requirements set forth in sections 2208 and 2209 of Public Law No. 114–190, the Federal Aviation Ad-

ministration Extension, Safety, and Security Act, and sections 376 and 377 of Public Law No. 115–254, the Federal Aviation Administration Reauthorization Act of 2018, despite the leadership of the National Aeronautics and Space Administration and the significant investment of time and resources by the private sector. As a consequence, the European Union and other countries have moved ahead with design and deployment of Unmanned Aircraft Systems Traffic Management (in this section referred to as ‘UTM’) systems. The Congress believes that now is the time to move forward with implementation by the adoption of standards and by providing financial incentives to the private sector to help progress the development of a UTM system in the United States.

- (b) **RULEMAKING.**—
- (1) **IN GENERAL.**—Not later than 270 days after the date of the enactment of this section, the Federal Aviation Administration shall amend the final rules adopted in the Remote Identification of Unmanned Aircraft Systems proceeding (Docket No. FAA–2019–1100, RIN 2120–AL31) in accordance with paragraph (2).
 - (2) **REQUIRED CONSIDERATION.**—In amending the rules pursuant to paragraph (1), the Administrator of the Federal Aviation Administration (in this section referred to as the ‘Administrator’), shall:
 - (a) Adopt ASTM International’s Standard Specification for UTM Unmanned Aircraft Systems Service Supplier Interoperability (ASTM Standard No. F3548–21) released on January 12, 2021, for the specification of components that may be used to satisfy requirements related to UTM regulations; and
 - (b) Accept other industry standards, including those from RTCA SC–228, to satisfy the specifications required for the remote identification of unmanned aircraft systems.
 - (c) **AUTHORIZATION OF APPROPRIATIONS.**—There is authorized to be appropriated to carry out the purposes in subsection (d) to further the development and implementation of UTM for the National Airspace System consistent with Public Law No. 115–254:
 - (1) \$20,000,000 for Fiscal Year 2023;
 - (2) \$20,000,000 for Fiscal Year 2024;
 - (3) \$20,000,000 for Fiscal Year 2025; and
 - (4) \$20,000,000 for Fiscal Year 2026.
 - (d) **ELIGIBLE ENTITIES.**—In this section, the term “eligible entity” means a state or tribal government, a political subdivision of a state, local, or tribal government, or a combination of such entities, or a non-profit or for-profit company, that intends to participate in a UTM system as an Unmanned Aircraft Systems Service Supplier.
 - (e) **AUTHORIZED PURPOSES.**—A grant provided under this section may be used for the following purposes:
 - (1) To research and identify meteorological data for low-altitude unmanned aircraft systems operations and to establish reliability measures for the meteorological data over traditional certification standards;
 - (2) To work with the Federal Aviation Administration and National Aeronautics and Space Administration to:
 - (i) Define and implement “Performance Authorizations” as such term is used in the Federal Aviation Administration UTM Concept of Operations; and
 - (ii) Combine airspace and operational approvals by means of UTM.
 - (3) To work with the Federal Aviation Administration and National Aeronautics and Space Administration to establish appropriate test and validation environments for Unmanned Aircraft Systems Service Supplier interoperability and approval of UTM standards and services, and to conduct testing of USS services and interoperability; and
 - (4) To work with the Federal Aviation Administration, the National Aeronautics and Space Administration, and cybersecurity experts to explore potential areas for cybersecurity resilience that can be used to develop performance requirements for UTM Service Supplier approvals, including but not limited to remote unmanned aircraft systems identification and network identification.
 - (f) **GRANT PROCESS.**—Within 60 days after enactment of this section, the Administrator shall develop a process for the submission, review, and granting of applications for grant funds to participate in UTM development.

OVERVIEW

There is wide-spread consensus that supporting multiple complex BVLOS operations will require a federated cloud-based UTM system. However, that system will take time to develop, while many UAS operators are already capable of safely conducting BVLOS operations, and many simpler BVLOS operations involving lower risk levels may not require a high degree of oversight or coordination. Regulations should provide a near-term solution that will allow such operators the ability to conduct BVLOS operations immediately after the regulations are finalized. Initially, the number of operators capable of conducting complex BVLOS operations will be limited, therefore the security requirements for BVLOS may be more cumbersome, e.g., less automated, than the envisioned but eventual, UTM system.

Remote ID of UAS is a security tool required by the United States government for operation by providing a “digital license plate” for nearly all UAS operating in the National Airspace System (NAS). A Remote ID system can give law enforcement, security officials, and the general public necessary information about a nearby UAS, which may help to ensure operations are safe and secure. International standards development organizations have produced Remote ID specifications that allow UAS operators to meet Remote ID requirements through two means—broadcast (based on radio frequency) and network (based on internet connectivity).

The Government Performance and Results Act requires DOT to set performance goals that are objective, quantifiable, and measurable. Although the FAA typically follows the Department’s performance-based requirements and allows industry to develop innovative solutions to meet that standard, the Remote ID Final Rule chose only one technology, broadcast, to comply with the rule.

AUVSI supports the Remote ID rule that mandates broadcast identification, however, many of our members are innovating alternative ways to comply with Remote ID as technology evolves, including network identification, which could help to enable UTM operations. AUVSI asks Congress to urge the FAA to explore additional identification solutions for Remote ID. As noted in the Remote ID Final Rule, the FAA should strive to ensure that they, along with the Department of Homeland Security (DHS) and Department of Justice (DOJ) are “prepared to solve safety and security issues related to those concepts based on more mature understandings.”

AUVSI asks that Congress urge the national security agencies to engage in an open dialogue with industry stakeholders and civil society stakeholders to find solutions that enhance Remote ID, specifically Remote ID solutions that enable Remote ID data to be accessed via a network, while maintaining appropriate privacy safeguards for UAS operators and customers.

Congress must provide clarity on UTM for industry in an effort to support more systematic integration of UAS and Advanced Air Mobility (AAM) into the NAS at altitude. This clarity should include requiring more collaboration between the FAA and National Aeronautics and Space Administration on their UTM positions. Additionally, any language around Network Remote ID should include a directive to the FAA rather than just urging a dialogue with national security agencies.

APPENDIX

QUESTIONS FROM HON. MARCUS J. MOLINARO TO ADAM WOODWORTH, CHIEF EXECUTIVE OFFICER, WING AVIATION LLC

Question 1. Mr. Woodworth, I'd like to hear more about the "cooperative airspace environment" that you mentioned in your opening statement.

Question 1.a. I'm sure you understand that there's concern within the General Aviation community about how they'd be able to see small drones like yours and how you'd be able to safely avoid other aircraft. I want to see this work, but can you tell me how new technologies are going to be able to safely co-exist with legacy aircraft?

ANSWER. A cooperative airspace environment is one in which we are able to use existing and new technologies to modernize the airspace in ways that will improve access for new entrants and enhance overall safety. We can do that by adopting existing, effective and affordable technologies such as ADS-B that increase operators' overall awareness of the airspace and aircraft around them. Through shared adoption of these technologies, commercial UAS will be able to discern the presence of other aircraft in an operating area, and safely avoid any legacy aircraft so that traditional pilots won't need to worry about seeing and avoiding small drones.

ADS-B is just one of many technologies produced and used globally that can provide electronic conspicuity to enable a cooperative airspace. In addition to ADS-B, there are capable non-TSO solutions that provide reliable awareness of a crewed aircraft that are affordable and easy to implement. These solutions should also be re-examined for application in this use case.

From the perspective of the commercial drone operator, a cooperative airspace will be underpinned by UAS Traffic Management (or UTM) technology that is used for strategic deconfliction, and will improve a safe and accessible low altitude airspace. UTM creates a co-operative environment for drone to drone separation through strategic deconfliction and can also increase awareness by surfacing information like TFRs and ingesting ADS-B or otherwise conspicuous crewed traffic. UTM systems are already being deployed by companies around the world for fleet management, including at Wing, and traffic awareness technology like ADS-B is critical to incorporating data about the presence of any general aviation aircraft in that low altitude airspace in the rare instances where that may occur.

Additional situational awareness capabilities, such as remote identification technology, will be helpful for law enforcement and the general public to discern the identity of uncrewed aircraft and their operators. These capabilities will assist law enforcement with threat classification and mitigation often associated with counter-UAS technology use cases. Using these tools that foster a cooperative and integrated approach to accessing our airspace, and building effective education campaigns to ensure operators are using them, will serve to isolate any incidents where mitigation tactics are even necessary. Counter-UAS is a combination of detection and mitigation, as well as responsible policies and frameworks that encourage safe and compliant use of UAS. There are a growing number of technological solutions that pair with 'traditional' counter-UAS capabilities that should be considered to help promote lawful UAS operations.

Question 1.b. What are the most detrimental ramifications if the FAA does not find a way to integrate UAS in the United States in a timely manner, as you see it?

ANSWER. The drone industry has demonstrated its ability and enormous potential at scale to offer numerous benefits to society including benefits to the economy, environment, equity, and safety. Several studies have quantified the various tangible benefits of UAS integration for communities across the country, from lower carbon

emissions to reduced traffic congestion to economic growth and job creation.¹ The American people would be missing out on these benefits if we cannot find a way to integrate UAS in a timely manner.

Equally important, however, is the importance of the U.S. maintaining leadership in technology and innovation from a global competitiveness standpoint. The U.S. has always led on aviation innovation, and with the rise of uncrewed aviation we have the opportunity for a once-in-a-generation leap forward. Without a regulatory structure in place that will allow for UAS integration, we will cede this leadership position to other countries. The technological innovation occurring in this industry—and all of the other industries involved with automation that this innovation will feed—will instead happen abroad, and it will take years for the U.S. to catch up. This will have a direct negative impact on the viability of commercial UAS businesses, their employees, their suppliers, and the customers they serve.

QUESTIONS FROM HON. GREG STANTON TO ADAM WOODWORTH, CHIEF EXECUTIVE OFFICER, WING AVIATION

Question 1. The drone industry is expected to create a large number of new manufacturing, software, and pilot jobs. But it is also expected to change the current workforce.

Question 1.a. What do we need to do as a country to be prepared to answer the needs of the drone industry?

ANSWER. One of the core principles shaping my leadership at Wing is that there is room for everyone in the airspace. My entry into aviation as a career has been rooted in my passion for, and the availability of, flying model aircraft. Others at Wing have come into their careers on entirely different paths, and we employ people who hail from a wide variety of professional backgrounds. This includes former military and civilian pilots and former airspace design manufacturers, but a huge portion of our workforce comprises those who previously have not worked in the aviation sector but are passionate about its future and wish to dedicate their expertise to creating a more inclusive airspace.

To address the needs of the industry, we need to seize on the opportunity we have to bring entire new populations into the aviation workforce. And my perspective is that the jobs created in this sector will be additive to current job fields, creating new economic opportunities that have not existed before. Many of the barriers to entry commonly associated with becoming a commercial airline pilot simply do not exist for becoming a drone pilot. As Wing has been doing, we can be proactive in doing STEM outreach with middle and high school students from different socioeconomic backgrounds. And we can leverage our community college system by developing curricula that are tailored to new industries around uncrewed aviation and automation, as your bill—the DIIG Act—proposes.

Question 1.b. How can we guarantee the next generation of pilots and aviation professionals more closely resemble the diverse communities we all come from and are properly equipped to handle this next generation technology?

ANSWER. UAS technologies have democratized aviation by offering a less expensive and more accessible way to pursue an aviation career. With lower barriers to entry and increased reach, the drone industry has enormous potential to further broaden and diversify the evolving aviation workforce. There are many examples of this potential already being realized with small businesses across the U.S. incorporating UAS into their offerings (photography, real estate, infrastructure inspection, etc).²

¹ See, e.g., 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); Virginia Tech Office of Economic Development, *Measuring the Effects of Drone Delivery in the United States*, (September 2020); Accenture, *Faster, Safer, and Greener: The Potential Impact of Delivery Drones in the Dallas-Fort Worth Metroplex* (Feb. 2021), available at: <https://storage.googleapis.com/wing-static-us/us/Dallas%20Impact%20Report.pdf>.

² See, e.g., *New Part 107 Waiver Report—Analysis of Advanced Operations Granted by the FAA*, AUVSI (2020), available at: <http://auvsilink.org/PDFs/Part%20107%20Waiver%20Update.pdf> (finding that a large portion of Part 107 waivers the FAA has granted are for commercial operations, with 87% of those businesses generating less than \$1M in annual revenues); *Demand for Drone Pilots Soars: UAV Jobs That Pay Over \$100K*, Vaughn College (August 2022), available at: <https://www.vaughn.edu/blog/demand-for-drone-pilots-soars-uav-jobs-that-pay-over-100k/> (noting that demand is currently surging for drone pilots and many positions provide salaries above \$100,000/year).

To enhance knowledge and understanding of UAS technology in the FAA's regulatory capacity and give greater visibility into the employment opportunities that this industry provides, it would be helpful for Congress to create programs for the FAA workforce to learn about UAS in greater depth. The FAA also would benefit from including UAS industry participants in legacy aviation working groups and committees to ensure that the Administration considers these perspectives in developing its rulemakings.

Exposure to drones through reaching new customers is another way to expand the access to aviation careers and open doors of opportunity to a more diverse workforce. Aviation, generally, is not bound to road systems and topography to the same extent as surface transportation. Since businesses are not constrained to roadway arteries, air transportation provides a means to reach more communities including communities that are not easily accessed by other modes of transportation. UAS technology as a subset of the aviation sector possesses even greater freedom, given the lack of air traffic corridors or routes and the ability to move equally in all directions. This flexibility unlocks unprecedented ways to provide services to underserved populations and expose even more people to the opportunities that UAS create from a customer and workforce perspective.

In addition to the benefits that can be enabled, Congress should protect the benefits that already exist. I have had the pleasure of spending my career in the aviation industry, working alongside hundreds of talented engineers over the years, and many can trace their introduction to aviation and subsequent career interest to building and flying model aircraft. Whether it was building a stick-and-tissue model on a grandparent's kitchen table, or excitedly approaching a family flying in a park, each had a story of the spark that set him or her down a path towards flight. Our industry has been built by, and sustained through, a flow of talented and inquisitive minds that have been nurtured and instructed by the hobby of model aviation. Current and future rulemaking should encourage, not hinder, this critical entryway to aviation.

QUESTIONS FROM HON. ANTHONY D'ESPOSITO TO ROXANA KENNEDY, CHIEF OF POLICE, CHULA VISTA POLICE DEPARTMENT

Question 1. Chief Kennedy, as a former NYPD detective and volunteer firefighter, I sincerely thank you for testifying today on behalf of first responders. There are many tools that first responders utilize to survey emergencies so they can effectively mitigate the situation. Many public safety groups that actively rely on tethered Unmanned Aircraft Systems (AKA drones) to carry out critical operations. New York City's pride, the FDNY, has a Drone and Robotics Team that plays a crucial role in life-saving missions. They respond to fires, building collapses, water rescues and many other disasters.

Question 1.a. Based on your experience, what value do tethered UAS's provide first responders?

ANSWER. Most communities have high expectations for the complex mission of law enforcement. But all communities expect that law enforcement is working to keep the community safe and secure. Drones can be a tremendous asset to enhancing that core mission. Law enforcement UAS programs use drones to get to incidents quicker before responding officers arrive, to provide first-hand and real-time information directly to field personnel and incident commanders. Direct and real-time information helps first responders to better understand the situation that they are called to and empowers them with better information with which to make emergency decisions that keep everyone safe.

My agency does not currently utilize tethered drones, so our experience with tethered drones is somewhat academic. But from a law enforcement perspective, tethered drones can provide the same type of capabilities as an untethered drone to enhance law enforcement's mission to respond to emergency calls for service, to protect life and property, and to keep our communities safe. Tethered drones have the unique advantage of being connected (tethered) to a fixed source that can provide constant power and communication, thus extending the drone's potential flight time by eliminating current battery limitations. The fixed power and communication source enables a tethered drone to operate for numerous hours at a time. Using a tethered drone can provide added security by being an airborne observation platform during public events large and small.

The deployment and use of a tethered drone in a local environment requires the support of the local community. Law enforcement agencies must endeavor to establish strong engagement and relationships with the community, to educate and enhance understanding about the intended purpose and use of a tethered drone. At

a local level, the use of a tethered drone is not intended for the purpose of surveilling the public. Instead, a tethered drone is intended to enhance law enforcement's capability, in a very unique and specific way, to keep our communities safe and secure. This level of understanding requires transparency, dialogue, and community engagement.

Question 1.b. Do you believe in this FAA Reauthorization that providing additional Tethered UAS systems would advance the mission of first responders?

ANSWER. While introducing a tethered drone into local law enforcement operations requires support from the local community, tethered drones can further supplement the law enforcement mission to protect and serve. Law enforcement drone programs are used to get to incidents quicker before responding officers arrive, providing first-hand and real-time information so that first responders are better equipped to make emergency decisions, and to keep our communities safe. The ability to monitor drone footage allows a law enforcement agency to evaluate a situation remotely and relay information to officers and supervisors in the field before they enter a danger zone. Using a tethered drone would be the same concept as my agency's Drone as First Responder program, except we would not be limited to the time restraints of the drone's battery. In addition, the drone footage can be live streamed to the incident commanders and first responders to determine the best tools, tactics, and resources to mitigate a problem, often before officers arrive.

Question 1.c. What would Law Enforcement like to see in the FAA Reauthorization?

ANSWER. Law Enforcement and the FAA relationship is important. We recommend the FAA include law enforcement in the discussions on the use and implementation of Drone as First Responder programs in the National Air Space.

There are some things they can

1. FAA'S COA Application Processing System (CAPS) Webpage
 - The website is cumbersome and difficult to navigate. It is not user friendly.
 - Additionally, the FAA requires a single user be registered to enter the monthly required COA flight data in the CAPS system. Only one user is allowed to enter information for any government agency changes. The website should allow multiple users per organization this is to prevent any single point of failure and allow an alternate or backup user to complete requirements.
2. Law Enforcement Assistance Program (LEAP) Agent Assistance
 - LEAP Special Agents should be more available to agencies looking to apply for or renew COAs and waivers. There are over 18,000 law enforcement agencies in the United States and very few LEAP agents which makes it challenging to locate and contact the LEAP agent for assistance.
3. New Technology Progression
 - FAA should continue to support law enforcement's use of drone technology. Recently the FAA authorized a completely BVLOS authorization for another law enforcement agency's DFR operation. This is huge step and a win for law enforcement agencies using drones.

However, The FAA's inconsistencies when it comes to COA and Waiver approvals create confusion. We recommend the recent approval of what some call the "digital visual observer", become a standard option for COA's. Removing the Remote Pilot in Command requirement will reduce staffing costs allowing more law enforcement agencies the ability to have a DFR program such as ours.

QUESTIONS FROM HON. GREG STANTON TO ROXANA KENNEDY, CHIEF OF POLICE, CHULA VISTA POLICE DEPARTMENT

Question 1. How has the use of drones enabled your department to better serve the community you help to protect?

ANSWER. The Chula Vista Drone as First Responder (DFR) program provides the ability to see what is happening at an incident before emergency personnel arrive on scene. In addition to the overhead perspective that traditional air support has always provided, DFR allows the teleoperator, a trained sworn officer, to "virtually" arrive on scene first, sometimes minutes before ground units are in harm's way.

The drone has a powerful onboard camera that streams HD video back to the department's teleoperator, a trained critical incident manager who controls the drone remotely and communicates with the units in the field to give them information and tactical intelligence about what they are responding to. The system also streams the video feed to the cell phones of the first responders (including fire personnel), supervisors, and command staff, so they can see exactly what the drone sees.

The Chula Vista Police Department Drone as First Responder (DFR) program has responded to over 14,500 emergency calls for service. Our program has reduced response, increased safety, and provided real-time information so our officers can make better-informed decisions. DFR is the most critical tool in improving situational awareness, de-escalating dangerous situations, and protecting our community, our officers, and the individuals we contact safer.

Question 2. What specific training was necessary for your officers to be able to leverage small UAS technology?

ANSWER. In addition to the training and study required to obtain and maintain a FAA Part 107 Small Unmanned Aircraft Systems (UAS) Pilot license, all Chula Vista Police Department UAS team members are required to train monthly which involves a variety of locations and settings to ensure operational efficiency including annual National Institute of Standards and Technology (NIST) sUAS test methods. All training is documented, and the records are maintained at the Chula Vista Police Department and are subject to review by the FAA.

QUESTIONS FROM HON. MARCUS J. MOLINARO TO STUART GINN,
M.D., MEDICAL DIRECTOR, WAKEMED INNOVATIONS, WAKEMED
HEALTH AND HOSPITALS

Question 1. Dr. Ginn: First off, I understand the head of SUNY Upstate's Drone and Robotics program is here with you, so I'd like to welcome you both and thank you for the research you do to advance this very important growing sector of aviation.

What is the primary concern you have that may be holding back the success of the UAS industry?

ANSWER. Thank you for the questions, Representative Molinaro.

The *lack of a coherent and integrated regulatory framework* for UAS operations is at the core of this emerging industry's failure to scale and deliver value, limiting advanced air mobility (AAM) *ecosystem innovation* and therefore public benefit and economic impact. In the absence of a predictable regulatory framework permitting scaled operations, the economics of drone-based products and services are not compelling enough (currently) to create value for either the companies attempting to innovate new systems using drones or, more importantly, for their potential customers, who seek to innovate using the technology. These operational limitations, in turn, inhibit incentives for innovation and development of critical ecosystem components (digital integration systems and technologies; ground-side infrastructure accommodations and improvements; data sharing and governance systems and technologies; etc) that will be necessary to develop fully integrated and cooperative UAS systems capable of delivering valuable services to businesses, communities, and citizens.

Put another way, effective innovation in the UAS space will flow from the application of the technologies towards solving problems "on the ground" in novel ways, not only from innovation in the vehicles themselves. Without a core set of regulatory assets permitting safe operations at scale, the AAM ecosystem may never mature enough to deliver value or create broad public benefit.

Question 2. Apart from you being a surgeon, you are also a manned pilot and a former airline pilot. Can you speak to some of the concerns pilots have with drone operations and how we may be able to help lay those concerns to rest?

ANSWER. Pilots are concerned that drones and other uncrewed systems represent a new category of "non-cooperative" traffic operating in the national airspace system. There are three general categories of concern about small uncrewed aircraft systems: *Visibility, ubiquity, and predictability.*

The concern among pilots—both general aviation and commercial/ airline pilots—is that uncrewed aircraft systems will lack *visibility* in the airspace system; that they may be literally invisible due to their smaller size, and technologically invisible, operating outside of the existing airspace system. As "non-cooperative aircraft" operating in shared airspace, the concern is that they may escape the crew's capacity to exercise their responsibility to "see and avoid". This is not a new concern, nor is it unique to drones and eVTOLs. Pilots have long worried about non-cooperative aircraft—for instance, those not equipped with Mode-C transponders; or even large birds or traditional model aircraft—but the current regulatory framework aims to mitigate these risks through the "see-and-avoid" concept. This, as you might expect, does not give much comfort to pilots operating in uncontrolled environments. So much so that new categories of technology such as ADS-B have been developed to make more aircraft "visible" in both controlled and uncontrolled airspace.

Secondly, pilots may be concerned that this new category of aircraft will be more *ubiquitous* and possibly numerous than existing aircraft, operating in places that have, until now, been outside or segregated from the national airspace system. Specifically, airspace close to the ground or near populated areas has been treated as effectively prohibited (with some caveats). Terminal areas, in particular (immediately surrounding airports and heliports)—where legacy aircraft operate at lower altitudes as they arrive and depart from ground-side facilities—represent airspace with an increased volume and density of aircraft operating in close proximity to one another, and pilots are understandably concerned that additional, smaller uncrewed aircraft will represent a significant risk, not to mention a source of distraction in an already high-workload environment.

Third, pilots may be concerned that uncrewed aircraft will operate or behave in *unpredictable* ways, since they currently fall outside of coherent or integrated regulatory and operational frameworks. This is another aspect of the “non-cooperative aircraft” concept of which pilots (especially commercial pilots) are already wary. Integration of NAS operations into the national airspace system will mitigate these concerns, as pilots will have a shared understanding of how, when, and where uncrewed aircraft will be operating. UAS will be “cooperative” and their operations predictable, just like other commercial aircraft.

From this perspective, the introduction of SUAS into the NAS, and more specifically the technologies and procedures that could be introduced to integrate them into the NAS, may represent an opportunity to de-risk existing non-cooperative aircraft via more inclusive technology platforms facilitating cooperation and visibility between aircraft. A good proxy for this category of technology may be the ADS-B system mentioned above, which augments ground-based radar systems and has markedly improved aircraft visibility and safety since its introduction. While the ADS-B system itself may face hurdles related to bandwidth and scale precluding incorporation of SUAS, it represents the kind of cooperative system that emerging technology should be able to facilitate at a much larger scale.

Once drones and uncrewed aircraft are integrated into the national airspace system—from both a regulatory and a technological standpoint—these risks and concerns will be adequately mitigated and pilots can operate with the assurance that any (or at least most) aircraft they encounter will be “cooperative” and visible, following the same rules as legacy aircraft operating in the national airspace system.

QUESTION FROM HON. GREG STANTON TO STUART GINN, M.D., MEDICAL DIRECTOR, WAKEMED INNOVATIONS, WAKEMED HEALTH AND HOSPITALS

Question 1. How have drones enabled you to better serve your patients?

ANSWER. Thank you for the question, Representative Stanton.

During the three years that WakeMed and our partners operated our drone-based medical package delivery system, we were able to significantly improve delivery times for routine blood samples between two of our facilities. More importantly, we were able to demonstrate the feasibility of integrating a drone-based small parcel delivery system into our healthcare operation, paving the way for a scaled system that would connect all of our hospitals and many of the smaller but critical facilities and operations in the community (free-standing Emergency Departments, pharmacies, clinics, laboratory facilities, imaging services, etc). Owing to current regulatory constraints, we (or more accurately, our operating partners, in this case Matternet and UPS) were not able to scale the system beyond our first pilot route, and have therefore been unable to realize the significant benefits to our operations and by extension our patients and our community.

Drones and eVTOLs (collectively “advanced air mobility”) will positively impact healthcare access in communities in the United States by connecting facilities and enabling the delivery of services in places and at times where our current healthcare infrastructure is strained or falling short. These are a new category of tools that, once scalable and integrated, will improve access to healthcare services by enhancing healthcare infrastructure and connecting healthcare providers to the communities they serve—and to communities they want or need to serve but cannot. In the aggregate, scaled and integrated AAM technologies will comprise new forms of flexible, nodal, dynamic, and affordable infrastructure through which healthcare systems can deliver more services to more citizens in more places than ever before.

QUESTIONS FROM HON. SHARICE DAVIDS TO KYLE CLARK, FOUNDER
AND CHIEF EXECUTIVE OFFICER, BETA TECHNOLOGIES

Question 1. I was proud to cosponsor a bill with Chairman Garret Graves last congress that became law—the Advanced Air Mobility Coordination and Leadership Act—that established an interagency working group to plan and coordinate efforts related to some of the most pertinent issues that can bolster the AAM ecosystem in the U.S. . . . With this working group established at U.S. DOT to begin coordinated discussions about the national future of AAM, what are the questions you would hope this group would ask? What answers do cities, states, stakeholders, and regulatory bodies need to prepare for a future with AAM?

ANSWER. The success of the Advanced Air Mobility (AAM) industry requires cooperation from all levels of government. With all relevant parties working together, AAM will be best positioned for seamless integration into our communities, including those in Kansas. We're eager to see the AAM Interagency Working Group's efforts kick off to ensure that the U.S. can be a leader here.

For starters, BETA would like the working group to explore how this industry can utilize existing infrastructure to help make AAM a reality. Electrification of our nation's public airports and access to existing heliports will help blend the innovation of AAM with assets that already exist. That means installing interoperable, on-airport charging infrastructure like BETA's that can service as many EVs as possible—surface vehicles and aircraft alike. It also means providing eVTOLs with a clear pathway to utilize existing heliports to safely land at.

BETA would also like the working group to explore what use cases the federal government has for AAM. Government adoption of these new technologies will not only bring many benefits and opportunities to the user, but also accelerate our industry's progress and spur commercial investment. Some use cases that we're already exploring at BETA include medical, patient, and equipment transport for the U.S. Department of Health and Human Services in a disaster-response role, and critical resupply and strategic personnel transport for our nation's armed forces, especially as the U.S. Department of Defense seeks to electrify its fleets. The working group should help determine additional use cases to maximize the benefits of AAM for as many stakeholders as possible.

Question 2. Have you all had any interaction with U.S. DOT or the FAA to begin participation in this working group?

ANSWER. BETA has had ongoing discussions with both U.S. DOT and FAA regarding the interagency working group, as well as the federal government's efforts related to "Innovate 2028" at the LA Olympics. We have highlighted the benefit of the cargo and logistics use case for AAM, and how it plays a critical role in the near-term deployment of this technology. We've already hosted several FAA officials at our headquarters, and have extended additional invites to Agency leadership as well as senior leaders at DOT and members of the working group. We know that seeing is believing, and are confident that bringing these leaders to our facilities to see this technology up close as we start manufacturing and delivering aircraft will help to demonstrate that electric aviation is here.

QUESTION FROM HON. MIKE COLLINS TO JOEBEN BEVIRT, FOUNDER
AND CHIEF EXECUTIVE OFFICER, JOBY AVIATION

Question 1. Mr. Bevirt, I've been talking to several manufacturers, and all of them have been talking about how difficult it has been to get FAA to certify new aircraft as quickly as they do in Europe. So much so that many companies are forced to consider moving operations overseas to get approval there first and subsequently waived through our process at FAA. That seems to give foreign manufacturers a substantial edge over Americans.

Aside from more money—which is what we always hear from the agencies—what policy changes are required to get FAA to move faster and eliminate bureaucratic inertia?

ANSWER. For the last century, the FAA has set the worldwide benchmark for aviation safety and operational efficiency. The FAA ensures that the U.S. maintains global aviation leadership through a balanced focus that assures that the complexities of the existing aviation system are addressed while allowing for the evolution of new technological innovations. Over the decades, this well-informed, forward-leaning approach has been key to setting the gold standard for aviation safety and efficiency.

To address these challenges, nuanced policy changes are necessary. These changes may include:

1. Supporting the FAA to be more forward-leaning with respect to the adoption of new innovations. As we evolve into the electric age of flight, there is no more important time for the experts at the FAA to assure these new capabilities are brought to market in a safe, timely and efficient manner.
2. Assuring the FAA is staffed with the best and brightest aviation minds and keeping the FAA involved in forums where leading edge technologies and standards are being evolved.
3. Assuring that the FAA leadership maintains focus on the efficient use of resources to assure that new aircraft projects can come to market safely, quickly, and efficiently. The FAA should provide Congress with a status of project efficiency and a plan for improving those measures on a quarterly basis.

By implementing these changes, we can strike a balance between maintaining a safe aviation system and fostering innovation. The FAA must have the necessary support and direction to navigate these complexities successfully.

QUESTIONS FROM HON. SHARICE DAVIDS TO JOEBEN BEVIRT, FOUNDER AND CHIEF EXECUTIVE OFFICER, JOBY AVIATION

Question 1. I was proud to cosponsor a bill with Chairman Garret Graves last congress that became law—the Advanced Air Mobility Coordination and Leadership Act—that established an interagency working group to plan and coordinate efforts related to some of the most pertinent issues that can bolster the AAM ecosystem in the U.S. ... With this working group established at U.S. DOT to begin coordinated discussions about the national future of AAM, what are the questions you would hope this group would ask? What answers do cities, states, stakeholders, and regulatory bodies need to prepare for a future with AAM?

Question 2. Have you all had any interaction with U.S. DOT or the FAA to begin participation in this working group?

ANSWERS to Questions 1 & 2. Thank you for your leadership in writing and passing the AAM Coordination and Leadership Act. As we think about the maturation of the AAM industry, this Act will ensure that the government doesn't create roadblocks to early and efficient implementation, and lessons learned from these early days can be utilized to create the safest, most successful, and most efficient AAM industry in the world. Here are recommended questions that we would like the working group to address:

- How does the group assure the capabilities in the existing FAA system can be fully utilized to support early AAM operations?
- What tools are available to quickly and efficiently evolve the aviation system based on early lessons learned to increase the operational efficiency and success of AAM?
- What can future AAM programs learn from previous success stories, like the Department of Defense's Agility Prime program and the National Aeronautics and Space Administration's National Campaign?
- Does the working group solely address electric vertical take-off and landing (eVTOL) aircraft? If not, how has the working group made the distinguishment between drones and eVTOLs? If both eVTOL and drones are being considered, we recommend separate policy recommendations, seeing that these two different industries already fall under different regulatory frameworks.
- What is the planned timeline to complete the work and to sunset the AAM working group?

As you well know, early AAM stakeholders have designed aircraft and operations that can be integrated into the existing FAA regulatory frameworks for aviation. From these early implementations, the working group could best interact with states and cities by listening and surveying the community's background knowledge on eVTOLs and whether these communities have engaged in preparing for the emergence of this technology.

We are pleased to welcome the working group to tour our facilities the week of June 26th, where we will continue conversations with the working group on the future of eVTOLs. We appreciate the working group's diligent work as they consider the maturation of the eVTOL industry, after Day-1 operations, and accompanying policy recommendations.

QUESTIONS FROM HON. SHARICE DAVIDS TO CHRISTOPHER BRADSHAW, PRESIDENT AND CHIEF EXECUTIVE OFFICER, BRISTOW GROUP INC., ON BEHALF OF THE HELICOPTER ASSOCIATION INTERNATIONAL

Question 1. I was proud to cosponsor a bill with Chairman Garret Graves last congress that became law—the Advanced Air Mobility Coordination and Leadership Act—that established an interagency working group to plan and coordinate efforts related to some of the most pertinent issues that can bolster the AAM ecosystem in the U.S. . . . With this working group established at U.S. DOT to begin coordinated discussions about the national future of AAM, what are the questions you would hope this group would ask? What answers do cities, states, stakeholders, and regulatory bodies need to prepare for a future with AAM?

ANSWER. Aircraft design is one part of AAM's pathway to realization, and safely operating those aircraft is where AAM's promise will succeed or fail. Bristow is uniquely positioned to leverage its over 75 years of global leadership in vertical flight operations to help ensure safe operations of Advanced Air Mobility aircraft. Operating aircraft is our mission, and safety is our number one core value. We all own safety in everything we do.

AAM pilot certification is key to safe operations and an area where the industry needs Congress' help. FAA must ensure a clear and viable pathway for civilian pilots to obtain the powered-lift certificate required to operate AAM aircraft.

We urge Congress to direct the FAA to modernize its regulations by establishing the powered-lift rating requirements as part of the FAA reauthorization legislation. Below is draft legislative language for your review, and we respectfully ask for your support.

When it comes to safety, Bristow leads by example. Through our Target Zero safety program, Bristow promotes and measures a safety culture that aims to achieve our goal of zero accidents and zero harm to people. Externally, Bristow is a founding member of HeliOffshore, the association of global vertical aviation operators dedicated to leading a collective safety conversation and transforming frontline safety performance.

Bristow is eager to take a leading role in defining the common language and framework that will enhance safety and ensure that the AAM industry focuses on activities that prevent accidents.

DRAFT LEGISLATIVE TEXT:

If the FAA has not promulgated a proposed SFAR before the House Transportation and Infrastructure Committee takes its FAA Reauthorization bill to markup:

SEC. XX. PILOT CERTIFICATION FOR POWERED-LIFT AIRCRAFT.

(a) RULEMAKING PROCEEDINGS.—

(1) MODERNIZING POWERED-LIFT PILOT CERTIFICATION.—The Administrator of the Federal Aviation Administration shall conduct a rulemaking proceeding to modernize its existing pilot certification requirements for powered-lift aircraft—

- (A) to take into account the previous experience of the pilot in an airplane or a helicopter as appropriate;
- (B) to take into account the important role that simulators will play in addition to flight time in this emerging aircraft segment; and
- (C) to grant an individual with an existing commercial airplane (single- or multi-engine) or helicopter pilot certificate the authority to serve as pilot in command of a powered-lift aircraft (in commercial operation) following the successful completion of an FAA approved pilot type rating course for that type of aircraft.

(2) DEADLINES.—The Administrator shall—

- (A) not later than 180 days after the date of enactment of this Act, issue a notice of proposed rulemaking under paragraph (1); and
- (B) not later than one year after the date of enactment of this Act, issue a final rule for the rulemaking under paragraph (1).

If FAA has issued a proposed rulemaking, but not a final rulemaking:

SEC. XX. PILOT CERTIFICATION FOR POWERED-LIFT AIRCRAFT.

(a) RULEMAKING PROCEEDINGS.—

(1) MODERNIZING POWERED-LIFT PILOT CERTIFICATION.—The Administrator of the Federal Aviation Administration shall issue a final rule-

making to modernize its existing pilot certification requirements for powered-lift aircraft—

- (A) to take into account the previous experience of the pilot in an airplane or a helicopter as appropriate;
 - (B) to take into account the important role that simulators will play in addition to flight time in this emerging aircraft segment; and
 - (C) to grant an individual with an existing commercial airplane (single- or multi-engine) or helicopter pilot certificate the authority to serve as pilot in command of a powered-lift aircraft (in commercial operation) following the successful completion of an FAA approved pilot type rating course for that type of aircraft.
- (2) DEADLINE.—The Administrator shall not later than 180 days after the date of enactment of this Act, issue a final rulemaking under paragraph (1).

Question 2. Have you all had any interaction with U.S. DOT or the FAA to begin participation in this working group?

ANSWER. Bristow proposed a candidate for membership on the FAA Advanced Aviation Advisory Committee, but has not received outreach from this group. However, we welcome participation and involvement in the Committee as it does its work. The AAAC can—and should—provide critical feedback and guidance to the FAA as AAM emerges.

QUESTIONS FROM HON. DINA TITUS TO CHRISTOPHER BRADSHAW,
PRESIDENT AND CHIEF EXECUTIVE OFFICER, BRISTOW GROUP INC.,
ON BEHALF OF THE HELICOPTER ASSOCIATION INTERNATIONAL

Question 1. As new airspace entrants continue to grow in our skies, it is critical that all airspace users are at the table to ensure the safe integration of these technologies.

In your opinion, are industry and the FAA adequately considering feedback from the conventional aircraft sector as they work towards integration?

ANSWER. Bristow Group is proud to have established strong partnerships with several manufacturers of Advanced Air Mobility (AAM) aircraft as we look to safely integrate this new technology into our fleet. We are committed to continuing to foster those relationships and to using over 75 years of experience as an operator in the vertical flight ecosystem to provide critical safety, operational, certification and logistical support to our partners in the AAM industry. We view AAM as an opportunity to augment our current operations to meet the ever-developing demands of our customers. Bristow envisions a future in which AAM can seamlessly co-exist with conventional aircraft in the National Airspace System (NAS).

Further, Bristow proposed a candidate for membership on the FAA Advanced Aviation Advisory Committee. While our candidate was not selected, James Viola of Helicopter Association International (HAI) was. Bristow is a member of HAI and looks forward to engaging with the Committee through Mr. Viola's representation.

While we understand the challenges the FAA faces in setting rules of the NAS for an entirely new industry, we are disappointed by the agency's lack of timely direction on issues that will affect us as a future operator in the AAM space. For example, the FAA has failed to adequately convey a pathway for civilian pilots to operate AAM systems. Current standards for AAM pilots require a powered-lift certification, but there are no powered-lift aircraft in operation outside of the military. Thus, civilian aviators seeking to enter the AAM field have no means of achieving the flight time necessary to satisfy the current requirement. We need practical options for operators to upskill their existing workforce and attract new talent to meet the anticipated demand for pilots in the AAM industry.

We believe that the FAA recognizes this problem. Deputy FAA Administrator Brad Mims stated at the recent Advanced Aviation Advisory Committee meeting that the FAA is on track to release an AAM pilot standard prior to the first generation of AAM aircraft being certified. We certainly hope so. Creating a defined, reliable route for civilian pilots to become qualified to fly AAM *prior* to aircraft certification is essential to aligning workforce and operational needs and getting AAM off the ground.

Question 2. Going back to the discussions on the previous panel with the BVLOS ARC report:

What do you recommend this Committee consider as it contemplates the safe co-existence of all airspace users in the upcoming FAA reauthorization bill? Is it the Thune/Warner bill? Is it requiring the FAA to pursue rulemakings without considering the recommendations of the BVLOS ARC? Or is it in somewhere in between?

ANSWER. The upcoming FAA reauthorization bill presents Congress with a critical opportunity to address the safe integration of AAM aircraft into the NAS. With the expected entry of AAM aircraft into service by 2024 or 2025, we urge the Committee to take a thoughtful approach to ensuring the United States can lead the world in this next phase of aviation. We ask that strong consideration be given to the needs of operators in the AAM space, including the aforementioned issue surrounding civilian pilot certification for which we have drafted a legislative solution.

Bristow Group stands ready to serve as a resource to the Committee and your office in achieving by leveraging our unique perspective as a mature and proven operator of vertical lift aircraft.

QUESTIONS FROM HON. SHARICE DAVIDS TO CLINT HARPER, ADVANCED AIR MOBILITY EXPERT AND COMMUNITY ADVOCATE

Question 1. I was proud to cosponsor a bill with Chairman Garret Graves last Congress that became law—the Advanced Air Mobility Coordination and Leadership Act—that established an interagency working group to plan and coordinate efforts related to some of the most pertinent issues that can bolster the AAM ecosystem in the U.S. ... With this working group established at U.S. DOT to begin coordinated discussions about the national future of AAM, what are the questions you would hope this group would ask? What answers do cities, states, stakeholders, and regulatory bodies need to prepare for a future with AAM?

ANSWER. The U.S. Department of Transportation’s newly established working group on Advanced Air Mobility (AAM) has a critical role in shaping the industry’s future. The questions it asks and the answers it seeks will have far-reaching implications for cities, states, stakeholders, and regulatory bodies. Here are the key questions and required answers to consider for effective AAM integration.

Questions for the USDOT Working Group on AAM:

1. How can we modernize and leverage existing airports (including the surrounding land, and surface corridors connecting to other economic activity centers) to serve as multimodal hubs that seamlessly integrate AAM with other forms of transportation and complimentary land uses?
2. How can AAM be integrated into the existing transportation system in a way that complements mass transit, rather than competes?
3. How can we ensure equitable access to AAM services for all communities, including underserved and rural areas?
4. What are the environmental implications of widespread AAM adoption, and how can these be mitigated?
5. How can public-private partnerships be leveraged to accelerate the development and adoption of AAM technologies and encourage cross-agency, multimodal, collaboration?

Answers Needed for Cities, States, Stakeholders, and Regulatory Bodies:

1. Cities and states need to identify potential funding sources for modernizing existing airports into multimodal hubs that integrate AAM with other forms of transportation.
2. Stakeholders require a clear roadmap for workforce development to ensure a pool of qualified staff for AAM planning, operations, and oversight.
3. Regulatory bodies need to establish a framework for oversight, including safety protocols, noise monitoring, and emissions standards, that is both comprehensive and flexible enough to adapt to emerging technologies.
4. All parties need to address the allocation of resources for emergency response, not only for incidents involving downed AAM aircraft within communities but also for the seamless integration of AAM into existing emergency services and disaster relief strategies.
5. A national strategy is needed to facilitate collaboration among federal agencies like the Federal Aviation Administration (FAA), Federal Transit Administration (FTA), Highway Administration (FHWA), and the Federal Emergency Management Agency (FEMA) to ensure a cohesive and efficient approach to AAM integration.
6. Cities and states need assurance on how electrical grids will remain resilient with the increased demand from AAM services.
7. Stakeholders require information on how AAM infrastructure can serve multiple purposes, such as integrating new microweather sensors for broader community benefits.

8. A comprehensive plan is needed to demonstrate how AAM infrastructure can contribute to community resiliency in the face of natural disasters and other emergencies, especially for tribal, rural, and marginalized communities.
9. Educational institutions and workforce development programs need guidance on how to prepare the next generation for the technological demands and career opportunities presented by the AAM industry.
10. What lessons are being drawn from the historical inequities and community displacements caused by past transportation infrastructure projects, such as the construction of urban highways that disproportionately affected communities of color, to ensure that AAM infrastructure is developed in a manner that is equitable, inclusive, and does not perpetuate systemic injustices or further isolate marginalized communities?

Question 2. Have you all had any interaction with U.S. DOT or the FAA to begin participation in this working group?

ANSWER. While I haven't formally engaged with the USDOT AAM Interagency Working Group, I have had previous collaborations with many of its members in my community advocacy role. My diverse background in aviation and city planning equips me with a unique vantage point to contribute meaningfully. With 24 years of aviation experience, including a career in the U.S. Air Force, I've gained invaluable insights into the intricacies of aviation infrastructure and operations. My journey also led me to earn a Master of City and Metropolitan Planning degree, further enhancing my understanding of urban dynamics and community needs.

Throughout my career, my passion for aviation and communities has been the driving force behind my pursuits. From my role in NASA's Air Traffic Management exploration program to serving as the first AAM Fellow for the City of Los Angeles, my work has always been guided by a commitment to equity, environmental sustainability, and accessibility. What sets me apart is my belief that AAM should not be treated as a technological sideshow, but rather as an integral component of community ecosystems. For me, the key lies in integration—through thoughtful collaboration, AAM should complement, not replace, existing transportation options.

If afforded the opportunity to speak on these critical matters, I would emphasize the need for a holistic approach to AAM integration. I would highlight the significance of integrating AAM seamlessly into existing transportation systems, leveraging the potential of multimodal hubs and integrating supporting infrastructure, such as novel microclimate sensors, for community benefits. Furthermore, I would underscore the importance of addressing historical transportation inequities and avoiding the perpetuation of systemic injustices. My goal would be to advocate for a future where AAM is embraced as a solution to current challenges while upholding the values of equity, sustainability, and accessibility.

Conclusion

In closing, by focusing on the critical questions and required answers outlined in this testimony, we can pave the way for an AAM ecosystem that addresses the diverse needs of communities, ensures equitable access, mitigates environmental impacts, and leverages effective partnerships. Through open dialogue and collaborative efforts, we have the potential to shape an AAM future that is grounded in real-world solutions and beneficial outcomes for all.

Feel free to contact me for any further questions. I thank you for your service and appreciate this unique opportunity to serve my country in return.

Attachments for Reference:

1. Statement of Clint Harper, Advanced Air Mobility Expert & Community Advocate, Before the Subcommittee on Aviation Hearing on "FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People" [Editor's note: See pages 85–91]
2. Advanced Air Mobility (AAM) as a Foundation of Community Resiliency: A Visionary Response to the USDOT Request for Information on AAM Integration [Editor's note: See pages 143–149]

QUESTIONS FROM HON. DINA TITUS TO CLINT HARPER, ADVANCED AIR MOBILITY EXPERT AND COMMUNITY ADVOCATE

Question 1. Climate change is already impacting millions of Americans and noise impacts are a constant concern for many communities, including in Las Vegas. Many advanced air mobility (AAM) aircraft are expected to use either low- or zero-emissions technology and be much quieter than traditional aircraft.

Question 1.a. Based on your expertise, how do you anticipate this will impact community acceptance for this new technology?

ANSWER:

Community Acceptance Now:

At present, I anticipate that community reactions to Advanced Air Mobility (AAM) will be dominated by skepticism. Given the historical context of aviation's environmental impact and its perceived exclusivity, community members are likely to be cautious about any claims made by the AAM industry. This skepticism stems from a broader distrust in new technologies that promise environmental benefits but often fall short in practice.

Community Acceptance in 5 Years:

Should the AAM industry fulfill its promises of low- or zero-emissions and quieter aircraft, I anticipate a complex evolution in community concerns within the next five years. As noise pollution becomes less of a focal point, attention will shift to grid sustainability, equitable access to services, and escalating safety concerns. The increasing operational intensity of AAM services will heighten worries about public safety, especially with more aircraft occupying the skies. Concurrently, questions will arise about the strain AAM technologies might place on the electrical grid, a concern amplified by the limited access most residents will have to these services. In essence, the dialogue will expand from environmental impact to encompass a broader spectrum of issues, including infrastructure resilience and public safety.

Community Acceptance in 10 Years:

A decade from now, if the AAM industry successfully integrates into the broader transportation system, I anticipate a notable increase in community acceptance. This acceptance will largely depend on AAM's ability to complement a safe, reliable, and interconnected mass transit network, providing an economically viable alternative to private vehicle ownership. Despite this progress, evolving concerns about safety, grid resilience, and equitable access will persist. While technological advancements and proactive industry efforts may mitigate these issues to some extent, they will remain central to public discourse. The industry's effectiveness in addressing these enduring concerns will be pivotal for both sustaining and enhancing community acceptance.

Question 1.b. What should companies be doing today to increase community engagement before entering into service?

ANSWER. Community members often first encounter AAM through sensational headlines fulfilling promises of 'flying cars,' obscuring the fact that AAM is fundamentally an aviation technology. When viewed through the lens of aviation, AAM emerges as the latest chapter in a century-long effort to democratize aviation services while reducing noise, environmental impact, and accessibility barriers. While this is a milestone worth celebrating, it can only be fully appreciated when we are transparent about the technology and its potential opportunities.

Proactive Community Outreach and Educational Initiatives:

To cut through the sensationalism surrounding AAM, companies must initiate honest dialogues with community members, addressing both the opportunities and challenges the technology presents. Alongside this, investments in educational and outreach programs are crucial. This dual approach not only clarifies misconceptions but also provides accurate information, fostering trust in the process. By channeling community concerns constructively, the industry can fine-tune its technology to serve as a viable solution for gaps that current transportation systems struggle to fill.

Collaboration, Equity, and Long-Term Commitment:

Companies must forge strong partnerships with local authorities to seamlessly integrate AAM into existing transportation infrastructures. This collaboration should be underpinned by an equity-focused approach to ensure that AAM services are accessible and affordable for all community members. Moreover, a long-term commitment to safety and sustainability is essential. This involves not only adhering to stringent safety protocols but also voluntarily investing in sustainable technologies and practices. By aligning these three pillars—collaboration, equity, and sustainability—the industry can address evolving community concerns and contribute to a more inclusive and resilient transportation ecosystem.

Transparency and Demonstrable Actions:

The AAM industry has a unique opportunity to substantiate its commitments through transparent data sharing and public demonstrations. Companies should

openly disclose data on emissions, noise levels, and safety protocols, thereby providing tangible evidence of their progress and accountability. Public demonstrations can act as real-world test cases, providing communities with firsthand experience of AAM technologies. However, these demonstrations should not be limited to exclusive, invite-only events, conferences, or trade shows. Rather, they should be genuinely public experiences to offer communities direct exposure to AAM technologies. These transparent and demonstrable actions not only validate the industry's claims but also serve as a powerful testament to its dedication to collaboration, equity, and long-term sustainability. Now is the time for the industry to move beyond promises and show, through transparent and accessible actions, how it is fulfilling its commitments to communities.

Question 1.c. Are you concerned about visual pollution? If so, what recommendations do you have to reduce visual pollution?

ANSWER. My primary concerns lie in the realms of safety, equity, and sustainability. The cinematic portrayal of skies littered with aircraft is far from our current reality for several reasons. First, the National Airspace System imposes stringent regulations that control aircraft separations to mitigate hazards, such as aircraft wake turbulence. Second, aircraft operating under Visual Flight Rules are required to self-separate, allowing pilots plenty of time to visually identify and mitigate potential hazards. Lastly, the availability of landing infrastructure, whether at airports or vertiports, naturally restricts the number of aircraft that can operate in a given area. As long as these constraints exist, the number of aircraft in the sky will be limited, making concerns about visual pollution less immediate than issues of safety, equity, and sustainability.

However, dismissing concerns about visual pollution would be irresponsible. This issue should be integrated into broader community outreach and educational initiatives. Companies can utilize existing technology to offer visual simulations that depict realistic scenarios, such as the number of aircraft that could be accommodated by local airports, single-pad vertiports, or multiple-pad vertiports. These simulations can serve as educational tools, helping to set realistic expectations and mitigate concerns. Transparency is key here, as with other aspects of AAM. Openly sharing these visual simulations can be a part of the industry's transparent and demonstrable actions, reinforcing its commitment to addressing community concerns in a holistic manner.

Conclusion

In closing, the AAM industry's future is anchored in a steadfast commitment to equity, sustainability, and accessibility. Collaboration with local authorities is not merely beneficial but crucial, serving to create a multimodal synergy. This ensures that AAM becomes a genuine complement to public transportation, rather than an exclusive service for a select few. Transparency is key, and open data sharing, coupled with public demonstrations, will be instrumental in building community trust. By focusing intently on these core priorities, the AAM industry is well-positioned to address public concerns and contribute meaningfully to a more resilient and inclusive transportation landscape.

Feel free to contact me for any further questions. I thank you for your service and appreciate this unique opportunity to serve my country in return.

Attachments for Reference:

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2. Advanced Air Mobility (AAM) as a Foundation of Community Resiliency: A Visionary Response to the USDOT Request for Information on AAM Integration [Editor's note: See pages 143–149]

ADVANCED AIR MOBILITY (AAM) AS A FOUNDATION OF COMMUNITY RESILIENCY:
A VISIONARY RESPONSE TO THE USDOT REQUEST FOR INFORMATION ON AAM
INTEGRATION

By: Clint Harper
August 15, 2023

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I. INTRODUCTION

Advanced Air Mobility (AAM) represents more than just a novel means of transportation; it holds the transformative potential to unite, uplift, and connect communities in unprecedented ways. Beyond serving as a mere novelty for the affluent, AAM is envisioned as a practical and affordable solution that can address a wide range of community needs, from daily commuting to emergency response. This vision positions AAM as a key tool for enhancing overall community resilience. However, realizing this vision requires substantial effort to equip communities with advanced tools and knowledge. For AAM to be genuinely integrated into the fabric of our communities, proactive engagement and education are essential. This involves more than just words; it calls for transparent dialogues, educational initiatives, and, most importantly, public demonstrations of vehicles that allow people to see and understand AAM in action.

My journey in aviation and community service spans over two decades, beginning with military service and extending through fire service, aviation planning, transportation planning, and economic development. These diverse roles have been more than just jobs; they have been a continuous education in the intricate relationship between technology, community, and service. My passion for serving communities has been the compass guiding me to explore innovative ways to better integrate aviation within our daily lives. Working alongside local and state officials has been not just a professional duty, but a personal privilege. I see advanced air mobility as an opportunity to contribute to sustainable community development efforts that are already underway.

There are several well-thought-out responses detailing valid concerns and issues regarding the integration of Advanced Air Mobility (AAM) technologies; I fully support their careful and thoughtful consideration. However, I have chosen to steer my response in a different direction. I aim to propose a vision—a vision that outlines how we can tailor AAM to work harmoniously within our communities. *My hope is to inspire positive change within the aviation industry, to advocate for a future where air mobility is more sustainable and accessible, and to encourage the industry to become better stewards of the communities they serve.* In doing so, I hope that the aviation industry can position itself as a part of the solution to existing and ongoing efforts aiming to rectify the harm inflicted by past transportation decisions. It is these goals that inform the vision proposed here.

II. VISION FOR AAM: A COMMUNITY-CENTRIC APPROACH

Integrating Advanced Air Mobility (AAM) into our national transportation fabric is more than a technological milestone; it is a profound opportunity to reimagine aviation as a catalyst for equitable and sustainable community development. While the urban air taxi use case is glamorous and groundbreaking, AAM should serve more than just large metropolitan areas and those who can afford steep ticket prices. It should extend to applications like medical logistics and emergency response, thereby enhancing overall community resilience.

Let's envision vertiports and UAS infrastructure as vibrant, multifaceted hubs—integral parts of our communities rather than isolated, purely functional, and mechanical sites. These *Resiliency Hubs* should fulfill at least three core roles: they must serve as *multimodal transportation centers*, act as *energy hubs* contributing to community resilience and sustainability, and function as *digital nerve centers*, enhancing digital connectivity for all. These hubs, whether arising from private investment or public funding, should harmonize with and complement local businesses, enrich public spaces, and respect the natural and cultural character of our communities.

For AAM to be genuinely integrated into communities, proactive engagement and education are essential. Addressing misconceptions and fears requires transparent dialogues, educational initiatives, and public demonstrations of vehicles. By actively involving communities in the AAM conversation, we can foster a sense of ownership and partnership. This ensures that the development of AAM aligns with community values and aspirations, rather than being perceived as an imposition.

III. RESILIENCY HUBS: THE HEART OF AAM INFRASTRUCTURE

An Introduction to Resiliency Hubs

Resiliency Hubs are envisioned as vibrant, multifaceted centers that are integral parts of our communities. More than just functional sites for AAM, they are conceived as community partners contributing to broader sustainability and resilience goals.

Multimodal Transportation Centers

Resiliency Hubs are designed to serve as multimodal transportation centers, seamlessly connecting AAM with other forms of transportation. This integration is essential. By weaving these hubs into the fabric of our neighborhood, they can enhance local transportation options and improve accessibility.

Energy Hubs

These hubs are microgrids, designed to contribute to community resilience and sustainability. They would generate renewable energy, which, while likely having limited capacity to charge aircraft, can significantly benefit host communities by supplying power to essential local services, thereby integrating AAM infrastructure into local energy resilience strategies.

Digital Nerve Centers

Resiliency Hubs are also poised to function as data and communications hubs, enhancing digital connectivity for all. As AAM, and other transportation modes, moves towards more autonomous operations, the digital infrastructure at these hubs will be integral to ensuring the safe and efficient operation of autonomous vehicles across different modes, making these hubs as central nodes in a complex, interconnected, safe, and reliable transportation ecosystem.

Whether arising from private investment or public funding, these hubs are designed to harmonize with and complement local businesses, enrich public spaces, and respect the natural and cultural character of our communities, rather than disrupt or overshadow them.

Resiliency Hubs Envisioned

As we examine deeper into the concept of *Resiliency Hubs*, it becomes clear that their implementation is not a one-size-fits-all approach. Instead, they are adaptable, designed to meet the unique needs and characteristics of the communities they serve. Two key forms of these hubs—airports and vertiports—serve as prime examples of how this innovative infrastructure can be tailored to different scales and settings, each with its own distinct opportunities and challenges. Let's explore these visions further:

Vertiports: The Community Connectors

Imagine a Vertiport located at or very near a major public transit station. It is a bustling center of activity beyond simply a landing pad for air taxis and drones. The integration of aviation into these multimodal hubs, along with associated investments, has elevated the overall character of the station for all modes, making the entire transportation experience safer, cleaner, and more efficient. An integrated microgrid, while not robust enough to charge aircraft, funnels produced energy back into the neighborhood, illuminating public spaces, powering community centers, and charging micro-mobility options.

Airports: Resiliency Powerhouses

In addition to being regional multimodal transit or freight hubs, existing airports are transformed into significant renewable energy generators. Their expansive footprints harness clean energy that powers not only airport operations but is also stores energy to contribute to the local grid. In times of a power outage, these airports can act as reliable backups, ensuring that essential services remain uninterrupted. They evolve from mere aviation hubs to critical components of the community's resilience strategy.

Resiliency Hubs also function as state-of-the-art digital communications centers. They ensure that essential digital services remain operational during significant network outages. These hubs offer high-speed internet access, enabling workers and community members to remote-work effectively and reliably, thereby serving as vital resources in bridging the digital divide. In emergencies, they transform into robust command and control centers, where various agencies can gather to manage response efforts effectively, taking advantage of, and building upon, aviation's natural role in emergency and disaster response.

These visions for *Resiliency Hubs* illustrate the transformative potential of integrating Advanced Air Mobility infrastructure into our communities. They are designed to be more than just functional sites; they are community partners that contribute to broader sustainability and resilience goals, harmonizing with and complementing local businesses, enriching public spaces, and respecting the natural and cultural character of our communities.

IV. REGULATORY LANDSCAPE: CHALLENGES AND OPPORTUNITIES

The regulatory landscape for Advanced Air Mobility (AAM) is complex and, at present, still somewhat murky. As we navigate this landscape, the need for a national strategy that is as dynamic as the technology it governs is paramount. This strategy should be expansive, inclusive, and agile, designed to address several key regulatory challenges and opportunities.

An Expansive and Inclusive National Strategy: Addressing Regulatory Challenges

Central to navigating these challenges is the development of a National Strategy for AAM that prioritizes equity at its core, ensuring that regulations are crafted to serve diverse community needs and not just a select few. This means welcoming the full spectrum of new and emerging aircraft, while embracing a rich spectrum of use cases that go beyond air taxis, including medical logistics, organ transport, emergency response, and regional air mobility.

By adopting an expansive and inclusive national strategy, we can address several key regulatory challenges:

- *Harmonizing Standards*: A unified national strategy can help to harmonize standards across states and localities, reducing the complexity for operators and manufacturers and ensuring consistent safety and operational protocols.
- *Equitable Access*: A focus on equity within the strategy ensures that regulations are crafted to promote widespread access to AAM services, avoiding the creation of a system that serves only the affluent in urban areas.
- *Adaptive Regulations*: An agile strategy allows for regulations that can evolve in step with rapid technological innovation, ensuring that rules remain relevant and effective without stifling innovation.

Navigating the Dichotomy: Federal, State, and Local Regulatory Roles

The current ecosystem for AAM presents a unique interplay between federal and local authorities. While the FAA clearly delineates the regulation of aircraft, operations, and airspace, the expected private development of AAM infrastructure introduces a new dynamic where state and local authorities play a significant role.

Federal Role: Setting the Standards

Performance-based regulations and standards, currently under development for vertiport infrastructure, present a promising path forward. These standards, led by the FAA, aim to establish a consistent safety baseline for AAM operations nationwide. They are adaptable and allow for local customization while maintaining a core set of safety and operational protocols. Performance-based regulations and standards should extend to vital supporting infrastructure, including communications, weather monitoring, and emergency response capabilities.

State and Local Role: Customization and Implementation

With much of the AAM infrastructure expected to be developed by private entities, state and local authorities are positioned as key partners in this process. They have the option to adopt federal regulations as they are or to adapt these policies and regulations to better align with local contexts and needs.

The Importance of Informed Decision-Making

Given the novelty and complexity of AAM, crafting effective state and local regulations is a nuanced task. This reflects the specialized nature of AAM. Collaborative efforts, involving federal agencies, industry stakeholders, and academic institutions, can provide valuable insights and resources to state and local authorities, supporting them in this important role.

The Risk of Inconsistent Regulations

The decentralized nature of this regulatory framework around privately developed infrastructure carries the potential for varied approaches across jurisdictions. This is not inherently problematic as each locale has unique needs but does highlight the importance of coordination to avoid unintended inconsistencies and consequences that could complicate or compromise the safety of AAM operations that occur over multiple jurisdictions.

The Need for Collaboration

This unique regulatory landscape of privately developed infrastructure underscores the need for clear and effective collaboration between federal, state, and local authorities. Establishing mechanisms for ongoing dialogue and coordination is essential, ensuring that regulations evolve cohesively as AAM technology advances and becomes an integral part of our national and local transportation ecosystems.

Adaptive and Evolving Regulations for a Dynamic Landscape

As Advanced Air Mobility (AAM) continues to evolve, so too must the regulatory frameworks that govern it. The rapid pace of technological innovation in this sector presents both an opportunity and a challenge. It is an opportunity to foster innovation through regulations that are as dynamic as the industry they are designed to support. It is a challenge because it requires a level of agility and responsiveness that traditional regulatory processes are not always designed to accommodate.

In this context, the concept of adaptive regulations emerges as a key theme. These are regulations designed to be flexible and responsive, evolving in tandem with advancements in AAM technology and operations. They are crafted with the understanding that as AAM matures, the rules that govern it may need to be updated, refined, or reimagined entirely. This adaptive approach is not solely the responsibility of federal authorities; it is a collaborative endeavor that involves state and local jurisdictions, industry stakeholders, and the public. It is about creating a regulatory environment where ongoing dialogue, data sharing, and joint problem-solving are the norms, not the exceptions.

In conclusion, the regulatory landscape for AAM is as pioneering as the technology itself. It is a landscape that we, as a nation, are charting together—federal, state, and local authorities, industry, and communities alike. As we move forward, our regulations must be more than just rules; they must be living, evolving frameworks that enable safe, equitable, and sustainable AAM operations, while empowering our communities to thrive in this new era of aviation.

V. TECHNOLOGICAL FOUNDATIONS FOR AAM

The promise of our presented vision for AAM and *Resiliency Hubs* is deeply intertwined with the technological innovations that underpin it. It is essential to understand the current technological landscape, the hurdles that must be overcome, and the symbiotic relationship between AAM technology and infrastructure.

AAM is not just about the aircraft; it's about the aircraft, operations, and symbiotic relationship with the entire ecosystem. The technology that powers AAM vehicles is deeply interconnected with the infrastructure that supports them. For example, the design of vertiports will be influenced by the energy needs of eVTOL aircraft, and the communications systems used by these aircraft will need to be integrated with broader traffic management systems and other supporting ground infrastructure.

Current Technological Hurdles

Energy Challenges and Infrastructure Solutions

One of the most significant hurdles for AAM is energy. Is the technology feasible, accessible, and reasonable in cost to enable the rapid charging of large battery systems, without inducing exorbitant ticket prices? The development of energy-dense and rapidly rechargeable batteries is critical for the widespread adoption of electric vertical takeoff and landing (eVTOL) aircraft. This challenge extends to the infrastructure, where the design of vertiports and other facilities will need to account for these energy needs.

Autonomy and Safety

Achieving the levels of autonomy required for large-scale AAM operations is a complex challenge. Ensuring the safety of these autonomous operations, particularly in densely populated areas, is paramount. The infrastructure plays a vital role here as well, as it will need to be designed to support the high-speed, low-latency communications needed to ensure safe and efficient operations.

The Role of Resiliency Hubs in Overcoming These Hurdles

Resiliency Hubs, as envisioned within the AAM context, are designed to be integral components of the AAM ecosystem, and of the communities they serve. In the context of these challenges, these hubs emerge as pivotal players, poised to address some of the key technological hurdles facing AAM in a thoughtful and holistic manner.

As we move forward, it is essential that our approach to AAM technology and infrastructure development is comprehensive and harmonized. The aircraft, the vertiports, the traffic management systems, and the energy infrastructure must all be developed in concert. This coordinated development should be guided by a unified vision that prioritizes safety, equity, sustainability, and community benefit, ensuring that AAM integration into our national and local landscapes is transformative and responsible.

VI. SOCIAL ACCEPTANCE AND COMMUNITY ENGAGEMENT

AAM integration into communities is not solely a matter of technological capability. It is equally a matter of social acceptance and actual need. Without community engagement and dialogue, AAM technologies present as a neat solution, without a real problem to solve.

Electric vertical takeoff and landing (eVTOL) original equipment manufacturers (OEMs) deserve a measure of appreciation for propelling AAM into the national spotlight. However, it is concerning that our leadership has responded by leaning heavily towards the air taxi use case. While this application is undeniably groundbreaking, its initial deployment is poised to serve only a select few large metropolitan areas, primarily catering to those who can afford the inevitably higher ticket prices. This approach risks setting a precedent of exclusivity that could prove challenging to overturn.

Equity must be at the heart of our national strategy. To this end, our strategy must encompass a rich spectrum of use cases that go beyond air taxis, embracing roles such as medical supply delivery, organ transport, emergency response, mid-mile cargo movement, last-mile package delivery, and regional air mobility. This means welcoming a diverse fleet of emerging aircraft, including electric conventional takeoff and landing (eCTOL) aircraft, electric short takeoff and landing (eSTOL) aircraft, and innovative uncrewed aircraft system (UAS) technologies. These varied use cases hold the promise of delivering tangible benefits to a broad cross-section of our communities, urban, suburban, and rural; extending AAM's benefits to beyond a privileged few.

Safety

Public acceptance of AAM is inextricably linked to safe aircraft, operations, and infrastructure. Comprehensive pilot training, and robust aircraft certification processes are foundational to this new era of aviation. However, safety extends beyond the aircraft themselves; it is deeply intertwined with the infrastructure that supports these operations. Communities need to be assured that the vertiports and other supporting infrastructure are designed, developed, and MAINTAINED with the highest safety standards in mind.

Noise

Noise pollution is a significant concern for communities when considering the integration of AAM. While many AAM vehicles might produce lower overall noise levels compared to traditional aircraft, the nature of the noise—often higher-pitched in the case of UAS—can still be perceived as disruptive. The Day Night average sound Level (DNL) metric, which currently governs legacy aircraft, may not be adequately equipped to address the unique acoustic profile of AAM vehicles. As AAM becomes more prevalent, there is a pressing need to revisit and possibly recalibrate these metrics to ensure community comfort, compatibility with wildlife populations, and acceptance.

Energy

With the onset of AAM operations, the demand on energy infrastructure will inevitably increase, posing significant challenges in a landscape where some energy providers already face strains. For instance, on hot days when air conditioning usage soars, energy infrastructure can be stretched thin, leading to situations where providers must institute policies such as rolling brownouts or requests for the public to refrain from charging electric vehicles during peak hours. A comprehensive AAM strategy must engage in a broader dialogue about how to enhance and stabilize the overall energy supply infrastructure in the U.S., ensuring that AAM can be integrated into communities in a way that is sustainable and equitable.

Proactive Community Engagement and Education

For AAM to be successfully integrated into daily life, proactive and transparent engagement with communities is essential. This involves educating the public on the benefits and safety measures of AAM, addressing concerns, and actively involving communities in the planning and decision-making processes. It means not only responding to community concerns but anticipating them and addressing them proactively through open dialogue.

Public Demonstrations

To build trust and acceptance, transparency in AAM operations is key. This extends beyond the aircraft themselves to encompass the entire AAM ecosystem, including infrastructure and operational procedures.

Aircraft Demonstrations: Public demonstrations that allow people to see, hear, and understand AAM vehicles in action are foundational. These events provide an opportunity for the public to witness the capabilities of these aircraft, understand their safety features, and appreciate the stringent standards they are designed to meet.

Infrastructure Showcases: Open houses at vertiports can demystify the infrastructure that supports AAM. These events can educate the public on the energy-efficient designs of these facilities, the renewable energy sources they may employ, and the community benefits they are designed to provide as *Resiliency Hubs*, such as emergency power during grid outages.

Emergency Response Exhibitions: As electric and autonomous technologies continue to proliferate across various industry sectors, the probability of related incidents will likely increase. These exhibitions could showcase how new response capabilities enabled by AAM can assist local fire departments and public safety officials in preparing for and responding to a variety of incidents, including those involving electric vehicles and related infrastructure.

Autonomy and Safety Exhibitions: Demonstrations that showcase how advanced autonomous systems can prevent incidents are vital. For example, simulations or live demonstrations could illustrate how autonomous systems can detect and avoid obstacles, manage complex air traffic scenarios, and safely handle emergency situations.

Microclimate Sensor Technology: Public demonstrations of advanced microclimate sensors can preemptively identify potential hazards—such as sudden wind gusts, microbursts, or severe turbulence—as well as provide a higher fidelity of data to decision making processes that will optimize the airspace; these demonstrations underscore a proactive commitment to safety. These sensors can also be instrumental in tracking hazardous plumes in emergency scenarios, or identifying areas with extreme weather conditions that might impact vulnerable populations.

Transparent Sharing of Records and Procedures: Coupled with these demonstrations, the transparent sharing of safety records, operational procedures, and incident response plans can go a long way in fostering public confidence. This could include public forums where operators and regulators answer questions and address concerns directly from the community.

These comprehensive public demonstrations and transparency initiatives are designed to demystify AAM and foster public confidence by allowing people to see, hear, and understand the full scope of the AAM ecosystem in action.

Equity and Inclusivity

To ensure that the AAM industry is reflective of the diverse communities it serves, intentional efforts must be made to cultivate a workforce that is diverse in race, gender, age, and background. This involves creating pathways for underrepresented groups to enter and thrive in the AAM sector, from pilots and engineers to policy makers and community liaisons.

Comprehensive and accessible training programs are therefore essential. These programs should not only focus on the technical skills required to operate and maintain new types of aircraft and infrastructure, but also on community planning, economic development, outreach and engagement, and cultural competencies.

The integration of Advanced Air Mobility into our communities is a societal shift that requires thoughtful, proactive, and transparent engagement with the public. This extends to fostering a diverse and well-trained workforce that is reflective of the communities AAM aims to serve. It is imperative that equity and inclusivity are

central to this transformation, ensuring that the benefits of AAM extend beyond a privileged few and contribute positively to all segments of society. Achieving this vision demands substantial funding, resources, and cooperation from industry stakeholders, government agencies, and communities themselves. It is through this collaborative and well-resourced approach that we can ensure AAM is introduced not as an imposition, but as a welcomed, beneficial, and integral part of our national and local transportation ecosystems. This collective effort is vital for enabling the AAM industry to launch, scale, and thrive in a manner that is safe, equitable, and sustainable for all.

VII. CONCLUSION AND A CALL TO ACTION

Integrating AAM as a catalyst for equitable and sustainable community development is possible through a collaborative effort. However, the current trajectory, leaning heavily towards the air taxi use case, risks setting a precedent of exclusivity that could prove challenging to overturn, serving only select large metropolitan areas and those who can afford higher ticket prices.

For AAM to be genuinely integrated into communities, proactive engagement and education are essential. This involves transparent dialogues, educational initiatives, and public demonstrations of vehicles. By actively involving communities in the AAM conversation, we can foster a sense of ownership and partnership, ensuring that the development of AAM aligns with community values and aspirations, rather than being perceived as an imposition.

The economic impediments facing AAM are deeply intertwined with the regulatory, technological, and social challenges that characterize this emerging industry. To chart a financially sustainable trajectory for AAM, a strategy must harmonize technological innovation with strategic infrastructure investments, offer clear and adaptive regulatory guidance, and maintain an unwavering dedication to community involvement and inclusivity. Federal investments should not just seek a return-on-investment in enabling safe operations, but also in how investments promote healthier, livable, and sustainable communities. These investments should not be viewed merely as costs, but as pivotal contributions to building stronger, more resilient communities, and ultimately a more resilient nation. By aligning AAM development with broader goals of community resilience, we can ensure that economic investments in this sector yield dividends that extend far beyond the industry itself, fortifying communities against a range of future challenges.

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