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Subcommittee on Aviation

“Preparing for Take-Off: Examining Efforts to Address Climate Change at U.S. Airports”

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Chair Rick Larsen and Ranking Member Garret Graves, on behalf of the General Aviation Manufacturers Association (GAMA) and its member companies, thank you for convening this hearing today, which will be vital to understanding the efforts which business and general aviation manufacturing companies and maintenance and service providers have undertaken to support environmental sustainability and address climate change.

We want to state the deep appreciation we have for this Committee and Congress for their support of the aviation industry. We look forward to working with you, House Transportation and Infrastructure Chair Peter DeFazio and Ranking Member Sam Graves, members of the House Aviation Subcommittee, and the membership of the Full Committee on issues of critical importance to the future strength of the United States (U.S.) aviation and transportation system.

GAMA represents more than 130 of the world’s leading manufacturers of general aviation airplanes, rotorcraft, engines, avionics, components, and related services and technologies. GAMA members are also providers of maintenance and repair services, fixed-based operations, pilot and maintenance training, and aircraft management. Additionally, GAMA represents companies in the emerging sector of advanced air mobility, which includes the development of vertical take-off and landing aircraft as well as electric propulsion, hydrogen-powered aircraft and autonomous systems for civil purposes. GAMA companies have facilities in 47 U.S. states

and 15 countries. A recent economic impact study determined that the general aviation industry supports \$247 billion in economic output and 1.2 million jobs in the U.S.¹

Our membership appreciates the opportunity to highlight the work being done to strengthen our record on addressing climate change. In addition to detailing our efforts, we would like to depict what can be done in the near- and long-term to further bolster the industry-government partnership to environmental sustainability and to slow climate change.

Our manufacturers, service providers, and operators are steadfast in their commitment to improve efficiency and mitigate our industry's impact on the environment. While we are focused today on climate change issues, it is important to understand our success and continued commitment to reducing other environmental impacts from aviation such as aircraft noise and NOx for all types of aircraft. We appreciate and respect the work that all our partners in the aviation ecosystem have also undertaken to address climate change. It is clear that we will need to all work together to achieve meaningful results in reducing the aviation sector's contribution to climate change.

Manufacturing and Technology Advancements

On behalf of the membership of GAMA, we are proud to highlight some of the advancements that are in place today that promote sustainability. Our members are committed to producing and delivering products that are sustainable and more efficient than their predecessors. In fact, the Federal Aviation Administration (FAA) states there has been more than a 70 percent improvement in fuel efficiency over the past 50 years with a vast majority of gains due to improved airframe and engine design.² We anticipate that by 2050, the new generation of aircraft benefitting from these improvements will generate on average 50 percent less CO₂ emissions compared to current levels. Examples of these gains on aircraft include changes in aircraft configuration, aerodynamics, systems, structural concepts, materials, and propulsion. Ground support equipment at airports, including refueling vehicles, are increasingly electric-powered, and installation of charging stations is growing in availability. In addition, many of our

¹ [General Aviation's Contributions to the U.S. Economy](#), 2018 Price Waterhouse Coopers Study on behalf of Aircraft Electronics Association (AEA), Aircraft Owners and Pilots Association (AOPA), Experimental Aircraft Association (EAA), General Aviation Manufacturers Association (GAMA), Helicopter Association International

² <https://www.faa.gov/newsroom/continuous-lower-energy-emissions-and-noise-clean-program?newsId=22534>

fixed-base operators (FBOs) have undertaken LEED-certified construction projects and installed solar panels at their facilities to reduce their demand on the electrical grid. Finally, several of our member companies are working toward or have announced environmental sustainability goals which demonstrate their commitment to sustainability.

One critical part of bringing sustainable products and technologies to market is the FAA's certification process. For the general aviation manufacturing industry to deliver safer and more sustainable aircraft, engines, and other aviation products in the global economy, an effective FAA certification process is vital. This Subcommittee, its counterpart Senate subcommittee, and the respective full committees devoted significant time and attention to reforms of the certification process which culminated in enactment of the *Aircraft Certification, Safety and Accountability Act*³. We remain appreciative of these efforts, and the industry and FAA continue to implement the law's requirements. An effective, reliable certification process is critical to the industry's ability to introduce innovative technologies and more sustainable products into the market. Simply put, certification is integral to the environmental commitments our industry has made.

In order for FAA to keep pace with innovation in the development of new products and technologies, FAA must issue new and updated regulations, policies, and guidance necessary to support certification for airworthiness and operations. Currently, there is a large backlog including regulations, policy and guidance. For example, at least 19 advisory circulars, technical standard orders (TSOs), and other documents that implement standards developed by RTCA to improve aviation safety and allow the certification of modern technologies are stalled. There are also more than 100 additional FAA actions needed in the form of policy memos, orders, advisory circulars, and TSO's that are currently in the bureaucratic process. Improvements are needed to the overall process in order to get these important FAA actions to advance, including for the new generation of electric propulsion, vertical takeoff and landing aircraft, and advanced air mobility operations. Successful development of these new sustainable technologies and aircraft requires that FAA establish a clear path for certification of aircraft and air carrier operations. The regulations for operations must either be updated to enable these new aircraft or the FAA will

³ Division V, Consolidated Appropriations Act, 2021 (P.L. 116-260)

need to process several deviations and exemptions from existing rules – both of which depend on FAA being able to promulgate rulemaking, policies and guidance expeditiously to enable these operations.

Sustainability efforts are also critical to competitiveness and energy security. In 2017, the International Civil Aviation Organization (ICAO) adopted the first-ever international standards to regulate CO₂ emissions from airplanes, and almost every nation has since adopted those same standards. However, the U.S. has yet to implement the standards, and we look forward to finalized rules by the Environmental Protection Agency to implement the ICAO standards as soon as possible to meet international deadlines. Adoption of these standards is vital to aerospace manufacturers, ensuring that their products can be accepted worldwide. Further, the U.S. must retain its leadership in shaping safety and environmental standards at ICAO to ensure the adoption is technically feasible, environmentally beneficial, and cost-effective standards in the global marketplace.

Business and General Aviation’s Commitment to Address Aviation Sustainability

The Business Aviation industry has a strong background in leading efforts to decarbonize aviation. In 2009, the GAMA and the International Business Aviation Council (IBAC) jointly announced the Business Aviation Commitment on Climate Change (BACCC)⁴, a program to address the industry’s carbon emissions, through three main objectives:

- Reducing CO₂ emissions 50 percent by 2050 relative to 2005 levels;
- Improving fuel efficiency 2 percent per year on average from 2010 until 2020; and
- Achieving carbon-neutral growth from 2020.

The industry achieved a 1.9 percent annual improvement in fuel efficiency on average since 2010, in line with our goal of a 2 percent improvement. At the time the BACCC was released, business aviation had already seen a 40 percent improvement in the fuel efficiency of our aircraft

⁴ <https://gama.aero/wp-content/uploads/GAMA-IBAC-Joint-Position-on-Business-Aviation-Tackling-Climate-Change-1.pdf>

over the past 40 years.⁵ The industry recently evaluated progress on meeting these goals and found that mainly through technology improvements and alternative fuels we are on track to meet the long-term goal of reducing CO₂ emissions by 50 percent in 2050 relative to 2005 levels.

After reviewing our progress toward meeting these objectives, the business aviation community committed itself to more aggressive goals. On October 12, 2021, a renewed effort to address climate change was announced with an updated goal of net-zero carbon emissions by 2050.⁶ The three primary objectives were also refreshed and include:

- Achieve net-zero carbon emissions by 2050.
- Continue to improve fuel efficiency 2 percent per year on average from 2020 to 2030.
- Commit to carbon-neutral growth beyond 2020.

To meet these commitments, we are focused on four key pillars which are crucial to meeting these goals. They include:

Technological Advancements – As stated previously, the aviation manufacturing industry is at the forefront of developing technological improvements to aircraft configuration, aerodynamics, systems, materials, and engine technologies which result in more efficient wing, rotor, fuselage, engine design, and operations. We are also furthering revolutionary innovations like hybrid, electric, and hydrogen-powered aircraft. These technological advancements are advancing our industry’s sustainability commitments to improve the fuel efficiency of aircraft and reduce emissions.

Alternative Fuels – The business aviation industry, along with other industry stakeholders and energy producers, has driven the research, development, and deployment of commercially viable, sustainable aviation fuels (SAF). The increased use of SAF will play a key role in reducing business aviation’s CO₂ emissions. Relative to petroleum-based conventional fuels, SAF blending components will deliver a net reduction in CO₂ emissions across its lifecycle.

Operations & Infrastructure – More efficient operations, stemming from continued progress on air-traffic management, along with measures including reduced payload, streamlined flight

⁵ <https://gama.aero/wp-content/uploads/GAMA-IBAC-Joint-Position-on-Business-Aviation-Tackling-Climate-Change-1.pdf>

⁶ <https://ibac.org/app/ibac/files-module/local/documents/Declaration%20on%20NZE%202050%20210922%20Final.pdf>

planning, and single-engine taxiing can play a significant role in reducing CO₂ emissions. Improving and enhancing air traffic and airport infrastructure can have multiple benefits for the business aviation industry including system-wide efficiencies that reduce CO₂ emissions.

Global Market-Based Measures - As business aviation continues to improve technologies, advance the production and uptake of alternative fuels, and push for operational efficiencies, it will also utilize market-based measures to offset emissions to fulfill its commitments. It is essential that global market-based measures are environmentally meaningful, and the administrative and implementation costs do not exceed the environmental benefits from compliance, particularly for small operators.

Business aviation industry partnerships with other industry players, governments, and regulators will be crucial to achieving our goals. Our commitment to addressing climate change is dependent on the support that authorities can provide to implement policies to help accelerate the uptake, distribution, and use of SAF as well as investments in research, development, and deployment projects to advance technology and facilitate operational improvements. Additionally, it will take buy in from all sectors of the industry to follow through to achieve the sustainable aviation future the aviation sector seeks.

Current Sustainability Policy Efforts and Next Steps

While these are industry-led objectives, we appreciate the fact that this Committee and others have considered and supported an array of policy efforts to facilitate our endeavors. Within the FAA's current authorization, an example includes the work of the Continuous Lower Energy, Emissions, and Noise (CLEEN) program as well as the FAA's ASCENT (Aviation Sustainability Center) program. By way of background, CLEEN is a cost-sharing effort with industry which aims to accelerate technology maturation that will reduce noise, emissions, and fuel burn and enable the aviation industry to expedite integration of these technologies into current and future aircraft. ASCENT is a coalition of 16 leading U.S. research universities and more than 60 private sector stakeholders conducting research to reduce aviation's environmental impact. These two partnerships have made significant contributions to address climate change within aviation and we look forward to leveraging their work further.

These efforts have yielded important advancements in areas like SAF. Once it was made available for use, GAMA, along with other general aviation associations, conducted a significant education campaign to ensure operators understood that SAF is safe and viable to put in their aircraft. As a result, today, FBOs are distributing SAF at airports and fueling aircraft with SAF, and aircraft are flying and conducting flight testing with SAF.

Work remains to deploy SAF on a broader scale, and we strongly support efforts that incentivize increased production and distribution of this more sustainable fuel. In fact, efforts are ongoing to incentivize SAF production where the fuel is currently not available particularly given it is not ideal to produce SAF in one part of the country and then transport it to another part of the country. GAMA is also a strong advocate for the SAF Blender's Tax Credit, which would provide a clear incentive to boost the production and distribution of SAF. This is particularly important given the comprehensive network of U.S. airport infrastructure. Finally, several of our member companies have been conducting R&D work on engines that would safely operate on 100 percent neat SAF, furthering our sustainability efforts.

We are also pleased that the Administration has taken several steps to support and promote SAF, including the SAF Grand Challenge. The initiative is intended to increase SAF production, accelerate research and development to improve aircraft fuel efficiency, improve air traffic and airport efficiency to reduce fuel use, and eliminate lead exposure. We recognize that many members of this committee have been strong leaders in many of these areas, and we look forward to continuing to partner in these efforts.

An additional legislative proposal that we would like to highlight is the "Aviation Emissions Reduction Opportunity Act" which has been introduced in the U.S. Senate (S. 3125) by Senator Raphael Warnock (D-GA), Senator Maria Cantwell (D-WA), Senator Gary Peters (D-MI), and Senator Alex Padilla (D-CA). Referred to as the "AERO Act," the intent of the measure complements ongoing efforts to accelerate the uptake, distribution, and use of SAF while simultaneously spurring investments in innovation and technological advancements. The measure proposes \$1 billion over five years in grants, with 30 percent of grants going to entities focused on developing, demonstrating, or applying low-emission aviation technology, and 70 percent of the funding dedicated to producing, transporting, or storing SAF. Airport sponsors are specifically listed as eligible entities to receive funding under this program.

Another initiative to highlight is the FAA's Voluntary Airport Low Emissions (VALE) program. The program allows airport sponsors to finance low emission vehicles, refueling and recharging stations, gate electrification, and other air quality improvements. As previously noted, electric vehicles are being used at airports now and aircraft of the future will rely on electric, electric hybrid propulsion and other technologies as well. Expanding the VALE program's eligibility would allow more communities to benefit from these low emission technologies and contemplating additional efforts to encourage and expand this effort merit consideration.

The Next Era of Aircraft

GAMA has been a leader in advocating for the advanced air mobility (AAM) sector, and a significant portion of our membership is involved in this emerging sector, which envisions highly automated electric aircraft and electric vertical take-off and landing (eVTOL) aircraft to transport passengers or cargo at low-to-medium altitudes in urban, suburban, rural, and regional environments. We appreciate the attention and focus policymakers have placed on AAM and the opportunity it may provide for increased transportation connectivity.

Under the leadership of Full Committee Vice Chair Sharice Davids (D-KS), Ranking Member Garret Graves (R-LA), Senator Jerry Moran (R-KS), and Senator Kyrsten Sinema (D-AZ), and many others who have supported this effort, we want to thank both bodies again for passing the "Advanced Air Mobility Coordination and Leadership Act" (H.R. 1339 and S. 516). The measure is intended to ensure the federal government is effectively engaged and coordinated internally, as well as with industry stakeholders, to support the evolution of AAM. It directs the creation of an interagency working group, led by the Secretary of Transportation, to review and make recommendations on policies and investments to facilitate AAM beyond initial aircraft certification and operations. This includes a focus on economic and workforce opportunities, potential physical and digital security risks and mitigations, and energy and transportation infrastructure. We encourage policymakers to complete consideration and send this bill to the president's desk in the near-term to further coordination and collaboration and enhance industry competitiveness.

As our industry moves toward introduction of AAM into the national airspace, enactment of either the House or the substantially similar Senate version of that legislation will also help

facilitate a closer working relationship between the FAA, Department of Transportation, and other interagency partners. For example, the Department of Energy will have a significant role to play in the future of airport infrastructure and its work with FAA will be crucial to the success of this endeavor. This legislation is a good bridge to highlighting several new aviation propulsion technologies that have tremendous potential to significantly reduce aviation's CO₂ emissions in the long term.

Ultimately, the future of electric aircraft, including eVTOL aircraft, depends to a great extent on infrastructure investment, such as investment in charging stations for electric propulsion and in vertiports for eVTOL aircraft. As the aircraft that will populate AAM networks are still undergoing the FAA's certification process, much of their operational features, such as charging mechanisms and related infrastructure requirements, are proprietary or not yet known. As Congress contemplates how to encourage the growth of this fledgling sector of the industry, we encourage flexibility given the scope and breadth of aircraft and airports' needs.

Propulsion types like electric, hydrogen and electric- hybrid propulsion will continue to advance. GAMA is privileged to represent companies working in each of these areas and the progress they are making are tangible. As these concepts move forward, focus on issues like airport infrastructure needs, operations, maintenance, and ground support and emergency preparedness will be critical. Moreover, and consistent with the conversations with other segments of the aviation industry and broader economy, the importance of workforce needs among these products' manufacturers, operators, and regulators will be critical, particularly in view of the fact that these technologies may require additional skills or competencies to ensure safety.

Finally, we commend the Committee's recent consideration and approval of "The Advanced Aviation Infrastructure Modernization (AAIM) Act" (H.R. 6270) and applaud Chair Rick Larsen (D-WA), Ranking Member Garret Graves (R-LA), and Representative Dina Titus (D-NV) for their leadership. As these vehicles move through the certification process, concurrent planning for their infrastructure needs should be contemplated to facilitate the needed local planning and infrastructure to prepare for future operations, and the AAIM Act is intended to encourage this collaboration. This is also increasingly relevant as regulators and industry work to define

consensus standards on vertiports which would serve as an additional infrastructure capability that is envisioned for use by AAM aircraft.

Addressing Piston Fleet Fuel

Finally, given the topic of this hearing is sustainability we wanted to highlight the collaborative efforts of numerous stakeholders to address fuel for piston-engine aircraft. The FAA has joined with aviation and petroleum industry stakeholders to work toward transitioning to lead-free aviation fuels for piston-engine aircraft by the end of 2030. The Eliminate Aviation Gasoline Lead Emissions (EAGLE) initiative will expand and accelerate government and industry actions and investments as well as establish the necessary policies and activities to permit both new and existing general aviation aircraft to operate lead-free, without compromising aviation safety and the economic and broader public benefits of general aviation.

We recognize that this is very ambitious, and each of the organizations involved are fully committed to EAGLE's success with work well underway. A key component of the EAGLE initiative will include an assessment of airport infrastructure needed to foster distribution of any certified and commercially viable replacement unleaded fuel or fuels.

The importance of this initiative to general aviation and U.S. general aviation infrastructure cannot be understated. There are more than 13,000 different airports which service the roughly 170,000 piston engine general aviation fleet. We expect the EPA to move forward with an endangerment finding this year which will trigger regulatory activity to ban leaded avgas. The clock is ticking, and we need to move quickly so that manufacturers have time to design, develop, certify, and build products that can operate safely on whichever unleaded fuel or fuels reach the market.

This work is consistent with the findings of a National Academies of Sciences, Engineering, and Medicine Study requested in the 2018 FAA Reauthorization Act.⁷ The resulting report, *Options for Reducing Lead from Piston-Engine Aircraft*⁸, was published last year and indicates that a

⁷ Section 177, FAA Reauthorization Act of 2018 (P.L. 115-254)

⁸ National Academies of Sciences, Engineering, and Medicine. 2021. *Options for Reducing Lead Emissions from Piston-Engine Aircraft*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26050>.

multi-pathway approach ultimately might be needed since there is currently no single known technical solution available in the near-term.

Conclusion

On behalf of our membership, we want to thank Chair Rick Larsen and Ranking Member Graves for convening this hearing and allowing GAMA to testify on industry efforts to mitigate the general and business aviation's impact on the environment. General and business aviation remains committed to ensuring our segment of the aviation industry plays a positive role in achieving a sustainable and competitive future for this essential industry. We are grateful that the Subcommittee and Committee has prioritized this issue and is working, on a bipartisan basis, with aviation stakeholders to provide the resources and programs needed to achieve a sustainable aviation future. Thanks to all committee members who participated today.