United States House Committee on Transportation and Infrastructure Hearing
"The Administration's Priorities for Transportation Infrastructure"
Testimony of Nicholas Guida
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Chairman DeFazio, Ranking Member Graves and Members of the Committee, thank you for accepting my testimony to the committee on "The Business Case for Climate Solutions." I am Nick Guida and I'm the founder and CEO of Tamarack Aerospace Group Corporation.

Climate change is of course one of the most significant challenges currently facing human civilization. Despite aviation being a relatively small contributor of overall global carbon dioxide emissions at 2-3%, aviation's statistical position is often cited in the media and that trend will no doubt continue as aviation continues to grow. (Graver, Zhang, & Rutherford, 2019). As a result, the environmental impact of flying is consistently breaking into the consciousness of passengers and the public alike, influencing their perception of aviation.

Aviation must leverage all legacy and especially new technologies to constantly strengthen a perception that the industry proactively supports sustainability and science that will mitigate the negative outcomes of climate change.

America and the world need to aggressively use all available current technologies to reduce the metastasizing carbon footprint and not ignore any pending technologies – including pending solutions like bio-fuels, electric and hydrogen propulsion - as they become commonly available over time. America needs to open its eyes to all current possibilities, especially those that are not widely known but can be so-called game-changers, game-changers that also make good business sense.

One such new, and game-changing technology available right now and gaining notice by the aviation industry and regulators, is Active Winglets™, developed by Tamarack Aerospace Group. Tamarack is based in Sandpoint, Idaho – we are a growing American company built on invention.

Active Winglets look very much like the curved-upward passive winglets you see on the ends of many commercial aircraft wings, except Active Winglets have an extension and an autonomous sensing system that in a fraction of a second mechanically adjusts the wing tips to any amount of turbulence and, in so doing, allows for the most efficient, fuel-saving and flight smoothing capabilities available today.

Patented Active Winglet innovation delivers a CO_2 and fuel burn reduction of up to 33% as compared to an approximate 4% fuel savings from different types of traditional winglets seen on many current commercial, business and military aircraft. Active Winglets increase the number of fuel efficient and safer non-stop flights, and reduce the amount of maintenance needed for all

aircraft. Active Winglet technology stands out in many ways amongst other sustainability initiatives as a sustainability supporting immediate solution for reducing aviation's carbon footprint to meet industry goals (Forbes Magazine, Tamarack Aerospace Group, 2020 and former aeronautical professor and commercial pilot, NASA astronaut Byron Lichtenberg, 2021, to cite just a few of the multiple sources).

There are several steps that aircraft operators can put in place to significantly reduce emissions. The science and market demands are dictating that we need to act now. Technology such as Sustainable Aviation Fuels are absolutely viable solutions but face significant scalability obstacles, carbon sequestration and offsetting would be required on a vast scale to have a significant impact and the introduction of newer, more fuel-efficient aircraft which emit less CO_2, will not be sufficient on its own to offset the growth in the number of air transport movements.

Active Winglets are a proven technology that has been installed on more than one-hundred-and-twenty Cessna Jets, has been certified by the Federal Aviation Administration (FAA) and European Union Aviation Safety Agency (EASA), and can be retrofitted onto several current aircraft variants, including larger single-aisle commercial, cargo and military aircraft … even drones. Active Winglets are cost-effective and can be rapidly retrofitted to the existing fleet as well as future designs to improve safety, mitigate turbulence, reduce noise and other pollution associated with aviation and reduce the downtime and need for aircraft maintenance.

The Active Winglet technology is economically viable, paying the investment for the modification back to the aircraft operator in a short period and can have a significant benefit for the existing as well as future fleets of aircraft. Of course, if business and government can't make an economic argument for adopting specific actions, those actions will naturally fail. Conservative estimates on narrow bodied and specific military aircraft, demonstrate that Tamarack's Active Winglets can reduce fuel burn by 14-20%, while there is proven fuel savings for many business airframes of up to 33%, providing significant cost savings and having a meaningful impact now on aviation's carbon crisis.

A case study conducted by Tamarack estimates, for instance, that if Active Winglets were to be fitted onto the commercial jet narrow-bodied fleet (Airbus A320 / Boeing 737 variants) alone, 1.6 billion tons of CO_2 would be saved by 2040, reducing the emissions gap by approximately 20%. Tamarack's technology offers a greater reduction in fuel burn and carbon emissions for existing aircraft than any other retrofittable solution available at present and certainly will make a demonstrable fuel savings and carbon footprint reduction as part of a new aircraft build.

More context about winglet technology. Winglets are small aerofoils applied vertically to the wing tips and are a positive addition to aircraft as they reduce drag and increase efficiency. They work by reducing the aerodynamic drag associated with vortices. Vortices form due to the pressure differentiation between the low-pressure upper wing surface and the high-pressure lower wing surface. At the wing tip, air is free to move from the regions of high pressure to the regions of low pressure forming a circular movement of air which trails from the wing tip (Anderson, 2017). The creation of vortices causes a redistribution of the surface pressure over

the wing termed induced drag (Anderson, Introduction to Flight, 2016). The advantages of Active Winglets are significant and address the vortices and fuel usage challenges more than other winglet technologies; they are retrofittable and therefore can improve today's aircraft, as well as those coming off the production line; they are largely cost effective to implement; and are a 'win, win' as they pay back economically and environmentally.

The Active Winglet uses the combination of a wing extension to significantly increase aspect ratio with the most optimal winglet to reduce induced drag. Traditionally, the most optimal winglet design is associated with more structural reinforcement, but the Active Winglet doesn't need the structural reinforcement that common passive winglets do.

Active Winglets reap maximum fuel efficiency benefits without subtracting the inefficiencies that occur due to additional structural requirements. This is achieved using load alleviation at the wing tip.

Additionally, Active Winglet modified aircraft need shorter runways for landing and takeoff and get higher faster than aircraft without the modification. For instance, it can take a Cessna Jet with Active Winglets to reach 41-thousand feet in less than 30-minutes, while a similar unmodified business jet will have to reach higher altitudes after climbing in steps and may never reach 41-thousand feet at all, depending on flight conditions and the time of the trip (AOPA reporting Active Winglet flight, 2021). As mentioned, once an aircraft gets to higher altitudes faster, the carbon footprint is greatly reduced.

Tamarack commends the committee on its backing of current U.S. government programs to encourage innovation in aviation and we hope that kind of assistance increases. This committee, for instance, is well aware of government grants for emissions innovative companies. For example, the Federal Aviation Administration (FAA) Continuous Lower Energy, Emissions and Noise (CLEEN) program has already contributed $225 million through phases I and II of CLEEN, and the industry has contributed $388 million. The 2020 grants under CLEEN III are to be issued soon (FAA, 2020). Tamarack will be applying for the next tranche of grants in order to go through the certification process for additional airframes. Meanwhile, we hope the committee will continue to encourage all technologies and efforts to embrace business cases for climate solutions.

Part of the reason that aviation is gaining so much attention relative to reducing the carbon footprint is an immediate need, like so many other industries, to reduce its dependence on fossil fuels in the face of expected continued rapid growth (UNFCCC, 2014). Active Winglets and other technologies available now or soon warrant additional focus by regulators and the entire aviation community.

The coronavirus pandemic has shrunk the world fleet because of airlines going out of business and older, less efficient aircraft being retired early. From 2020 onwards, this will unquestionably deliver reduced CO_2 emissions lower than previously projected. However, this is not the solution to aviation's carbon emission challenges. Although passenger numbers dropped by 2690 million

(60%) in 2020 compared to 2019, passenger numbers are predicted to recover to 2019 levels within the next 3-5 years (ICAO, 2021). Furthermore, in 2020 compared to 2019, approximately USD-370-billion of gross passenger operating revenues of airlines were lost (ICAO, 2021). This unprecedented event could present a major opportunity for operators to reset their thinking on emissions targets and implement sustainable practices in every aspect of their new, reshaped organizations.

Aircraft are reliant on fossil fuels and with no clear path or timeframe to a zero-emission alternative, ICAO predicts a large gap in the emissions targets set for the period of 2020 to 2040. There are several steps that aircraft operators can put in place to significantly reduce emissions. The science and market demands are dictating that we need to act now. Technology such as Sustainable Aviation Fuels are absolutely viable solutions but face significant scalability obstacles, carbon sequestration and offsetting would be required on a vast scale to have a significant impact and the introduction of newer, more fuel-efficient aircraft which emit less CO_2, will not be sufficient on its own to offset the growth in the number of air transport movements.

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As availability of Sustainable Aviation Fuels increases and technology advances, the aviation sector will see substantial reductions in carbon emissions until zero emissions aircraft can be developed. However, where a near-term solution is needed, fitting Active Winglets would be a significant step forward for operators looking to obtain carbon neutral operations, particularly when combined with a host of other sustainable initiatives. Tamarack hopes this committee considers all emission reducing options including Active Winglet technology that stands out as an exciting prospect which can reduce the emissions gap by over 1.6 billion tons (-20%), it is available now and is scalable.

As mentioned, Tamarack is growing. We have additional primary service and installation centers in South Carolina and England and other support facilities in more than twenty other locations across the United States and world-wide. We have been growing our facilities, staff, and customer base, despite the pandemic because our current and prospective customers want the innovative capabilities only Tamarack Active Winglets can provide to business, commercial and military aviation.

Tamarack is currently working with U.S. and international aviation regulators, along with aviation associations like NBAA and GAMA, noted academia representatives and getting constant feedback from existing and future customers, including the U.S. military. We are confident that U.S. innovation tempered by prudent government regulation will meet or possibly exceed carbon footprint reduction goals specifically outlined for the aviation industry. Those ambitious goals

will only be achieved through cooperation and teamwork involving all stakeholders and by climbing the very steep education curve that recognizes and adopts the most pragmatic innovations addressing our climate crisis.

Tamarack thinks of itself as a good corporate citizen for America and also the world and believes news about its sustainability-supporting technology, and other avenues for aviation to reduce carbon emissions, will be recognized by this committee as a current way to quickly provide a solution to help the growing aviation industry reach its carbon footprint reducing goals.

Tamarack looks forward to providing details and science-based information alluded to in these comments and will eagerly cooperate with this committee to embrace solutions that bolster the reputation of aviation as we achieve the climate-saving goals we all want.