

AIRLINES AND INDUSTRY WORKING TOGETHER TO CONNECT AND PROTECT THE PLANET

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US airlines have a decidedly strong greenhouse gas (GHG) emissions track record that is often overlooked or misstated. We contribute just under two percent of the nation's GHG emissions. To put that into context, passenger vehicles and power plants account for over 17 and 28 percent of GHG emissions, respectively. Worldwide, aviation is responsible for just two percent of global GHG emissions.

Aviation is vitally important to local, national, and global economies, supporting a large percentage of economic output. Indeed, commercial aviation drives 10.2 million US jobs, \$1.5 trillion in economic activity, and five percent of our nation's gross domestic product. In 2018, US air travel exports of \$41 billion helped fuel \$214 billion in other US travel and tourism exports. Every day, our planes carry some 2.4 million passengers and 58,000 tons of cargo across the country and to more than 80 countries.

Despite this tremendous record, some – particularly in Europe – want people to be ashamed of flying. However, in the words of *Air Transport World's* Editor-in-Chief this “flying shame” movement is “misinformed and misguided,” and all of us in aviation must strive to counter it.

Here are the facts: Between 1978 and year-end 2018, US airlines improved their fuel efficiency by more than 130 percent, saving nearly five billion metric tons of carbon dioxide (CO₂) – the equivalent of taking 26 million cars off the road each of those years. We carried 42 percent more passengers and cargo in 2018 than in 2000, while emitting only three percent more CO₂ emissions.

Airlines have achieved this record by driving and deploying technology, operations, and infrastructure advances to provide safe and vital air transport as efficiently as possible. For the past several decades, airlines have dramatically improved fuel efficiency and reduced CO₂ emissions by investing billions in fuel-saving aircraft and engines, innovative technologies like winglets (which improve aerodynamics), and cutting-edge route-optimization software.

Since 2009, Airlines for America (A4A) and our member airlines have been active participants in a global aviation coalition that committed to fuel efficiency improvements of 1.5 percent the annual average through 2020, with a goal to achieve carbon-neutral growth in international aviation from 2020 onwards. Further, our coalition, which also includes air navigation service providers (ANSPs), airports, and airframe and engine manufacturers, is working toward achieving a 50 percent net reduction in CO₂ emissions in 2050, relative to 2005 levels.

Industry will meet these goals by continuing to work together on advances in technology, sustainable aviation fuels, air navigation infrastructure and procedures, and operations, coupled with investments in additional emissions reductions under the 2016 aviation carbon emissions program signed by the 193 Member States of the International Civil Aviation Organization (ICAO).

Green Technology

On the technology side, each new generation of aircraft reduces emissions by 15 to 20 percent. Since the end of the Great Recession, US airlines and aircraft operators have been able to invest billions of dollars to upgrade their fleets with newer aircraft that produce fewer emissions and less noise. For example, US airlines purchased more than 480 new aircraft in 2017, with more than 1,550 additional planes expected in the coming years. Our airlines have also made significant investments in winglets, altering fan blades, and other measures that improve aerodynamics.

Our efforts are focused not only on today's fleet, but tomorrow's as well. Accordingly, we are partnering with airframe and engine manufacturers, the FAA, and NASA to advance evolutionary and

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revolutionary technologies' research, development, and deployment. In addition to continuous evolutionary improvements in propulsion systems, aerodynamics, materials, and structures to help us meet our goal for carbon neutral growth, we're working on radically new aircraft configurations (such as the blended-wing body and strut-braced wing) and propulsion technologies, such as open rotors and electric and hybrid-electric aircraft propulsion, which could be key contributors to meeting our 2050 goal.

Sustainable Aviation Fuel

Since improving fuel efficiency with today's petroleum-based energy supply is only part of the puzzle, we have been partnering across the aviation industry to develop commercially viable, sustainable alternative jet fuel, referred to as "sustainable aviation fuel" (SAF), which could be a game-changer in terms of aviation's output of GHG emissions while enhancing US energy independence and security.

There are three core criteria for airline deployment of SAF. The fuels must be:

- Equally as safe and effective as petroleum-based jet fuels.
- Environmentally superior to petroleum-based fuels.
- Commercially viable.

In 2006, A4A, FAA, Aerospace Industries Association, and Airports Council International-North America co-founded the Commercial Aviation Alternative Fuels Initiative® to serve as the driving force for the development and deployment of SAF. We are ensuring safety by requiring that all SAF meet the jet fuel specification, demonstrated through specific standards and processes. Accordingly, there are now five approved "pathways" for SAF production, pairing processing technologies with renewable feedstocks such as forestry residues, grasses, energy crops, municipal solid

waste, and other biomass or industrial wastes, with other pathways pending.

We are ensuring environmental benefits through GHG emissions lifecycle assessment, which calculates the reduction in GHG emissions associated with the production, transportation, and use of SAF, and an evaluation of the fuel under other relevant environmental and social "sustainability" criteria. As carbon is fundamental to powering aircraft engines, the CO₂ generated upon combustion cannot be eliminated through the use of SAF, but it can be reduced by increasing the per-unit energy provided in the fuel, reducing or avoiding GHG emissions somewhere along the "lifecycle" of the fuel, or some combination of the two. As a result, SAF has been shown to achieve up to 80 percent emissions reduction as compared with fossil-based jet fuel.

Since SAF tends to be considerably more expensive than traditional jet fuel, we are working on a means to scale up supply and reduce costs. Airlines are playing a key role by signaling farmers and others who generate energy feedstock, as well as investors in the alternative fuels industry. Further, A4A has teamed with the US Department of Defense's procurement arm to further encourage alternative fuel producers to include SAF in their product slate. We have been working to make federal and state programs available that support the deployment of ground-based alternative fuels. Our efforts are bearing fruit, such that United Airlines is already taking commercial supply of SAF at Los Angeles International Airport. In addition, Alaska Airlines, American, FedEx, JetBlue, and Southwest all have agreements to support future deployment of SAF fuel.

ATM to Fly Greener Skies

As recognized by the Future of Aviation Advisory Committee in 2010, "NextGen will enable the NAS to safely and efficiently accommodate greater numbers of aircraft ...

while reducing the overall environmental impact and energy use of civil aviation."

While air traffic controllers are working with airlines to promote efficiencies within the current ATM system, completing the transition to a satellite-based system will significantly reduce the inefficiencies inherent in the outdated, radar-based system – saving up to 12 percent of fuel burn and emissions.

A4A has pushed to accelerate implementation of NextGen and Performance Based Navigation (PBN) procedures, especially considering the more than \$1 billion operator investment to meet the impending January 1, 2020, ADS-B regulatory equipment mandate deadline. In 2013, the Department of Transportation's Inspector General attributed the delayed implementation of new PBN routes and procedures to a bureaucratic procedure development process and insufficient communication with controllers and operators.

US aviation has a strong record of aircraft noise reduction – having reduced the number of people exposed to significant aircraft noise by 94 percent since 1975 while more than quadrupling enplanements. Although PBN procedures can further decrease the number of people exposed to aircraft noise, they can shift who is exposed or concentrate noise exposures, raising community concerns. The FAA has updated and augmented its protocols for conducting community outreach when new ATC procedures are being considered, and the FAA and US airlines have been working together to minimize noise exposures and educate communities regarding PBN's benefits. Nonetheless, community and political pressure, and litigation regarding new procedures, continue to pose significant challenges.

Despite these challenges, the aviation industry must continue to work towards smart implementation of ADS-B, PBN, and other NextGen elements because an optimally functioning ATM system is not only indispensable to ensure the safety and the wellbeing of our industry, our nation's economy, the ATC workforce, and airline customers, it is also critical to the environment.

Further Greening Operations

A4A airlines continue to exhaustively review ways to make their aircraft operations and services more fuel and emissions efficient. For example, airlines are reducing the weight they carry – removing seat-back phones, excess galley equipment and magazines, introducing lighter seats and beverage carts, stripping primer and paint, replacing flight

bags with flight crew tablets, and myriad other measures – to save fuel. Demonstrating that the efforts extend to the smallest details of airline operation, our members have worked on redistributing weight in the belly of aircraft to improve aerodynamics and have introduced life vests on certain domestic routes, allowing them to overfly water on a more direct route. They are employing single-engine taxiing when conditions permit, redesigning hubs and schedules to alleviate congestion, and converting to electric ground support equipment when feasible. Further, our airlines are improving ground operations by plugging into electric gate power where available to avoid running auxiliary power units. With fuel being one of the highest and most volatile cost centers for airlines – and every penny of increased fuel price equating to an additional \$200 million fuel bill per year – not only do these fuel-saving measures bring environmental benefits, but they also make good business sense.

Investment in Additional Carbon Reductions

We plan to maximize fuel efficiency and emissions savings through new aircraft technology, SAF, optimized ATM, and other

operational and infrastructure improvements. However, A4A and our members championed the 2016 agreement reached at ICAO for a Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) to help “fill the gap” should we not be able to achieve carbon-neutral growth in international aviation by 2020. Since 2016, A4A and our member airlines have worked hard to ensure CORSA’s successful implementation.

The CORSA agreement has two parts. First, beginning on January 1, 2019, it required that all aircraft operators with international flights emitting more than 10,000 metric tons of CO₂ monitor and report their emissions under a common set of rules. (Although US aircraft operators have reported fuel burn and emissions to the US government for many years, the ICAO agreement made it a global requirement). Second, CORSA includes a carbon offsetting obligation, which will commence in 2021 and continue through 2035. This obligation will ensure that should international aviation emissions rise over 2020 levels, those increases will be offset by investment in emissions reductions achieved elsewhere.

While aviation has a tremendous fuel efficiency record and is relentlessly pursuing further improvements, the growing demand for air transport may outstrip the pace of efficiency gains and SAF deployment in the short run. Yet, there are other methods to reduce carbon emissions. For example, Conservation International notes that airline investment in forest preservation can provide high-quality emission reductions to meet the industry’s climate goals while simultaneously protecting biodiversity, supporting local communities, and maintaining vital ecosystem functions. ICAO has adopted stringent criteria to ensure that carbon offset and savings programs accredited under CORSA bring real environmental benefits, and it has a 19-country group of experts to officiate this process.

Flying Proud

The combined work of airlines, ANSPs, airframe and engine manufacturers, and airports has made US aviation a green engine of the economy. By working together to meet our forward-looking emissions targets, we will make it even greener, ensuring we all can fly proud. ✈️

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