Airlines for America®

We Connect the World

# Sustainable Aviation Fuels / Addressing Local Air Quality

## Aviation Noise & Emissions Symposium 2023

UC Davis – May 2, 2023

# Context: U.S. Airlines' Have a Strong Environmental Record

- Strong climate change commitments since 2009 – strengthened significantly in 2021 (see next slide)
- Strong supporters of standards for aircraft and engine emissions standards, including Aircraft $CO_2$ and noise standards, Oxides of Nitrogen (NOx ) and particulate matter (PM) engine emissions standards
- Strong supporters of Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)
- Improved fuel efficiency over 135% from 1978-2021
- Help drive ~5 percent of U.S. GDP while accounting for just ~2 percent of U.S. GHG emissions
- 94% reduction in significant noise exposures 1975-2019 (passengers up 379%)
- CO and smoke virtually eliminated; NOx from aircraft continually reduced

## Pathways to Improve Upon That Record

- Technology: New aircraft/engines plus enhancements (e.g., winglets) and R&D for breakthroughs
- Operations: Weight reduction, cargo distribution, engine wash, single-engine taxi, ground power at gates
- Infrastructure: Delivering 21st Century air traffic control ("NextGen")
- Sustainable Aviation Fuels (SAF) – liquids for now, but electric/hybrid or even hydrogen in long term

# U.S. Airlines Led in Making Very Ambitious Climate Change Commitments

**March 20, 2021:** ***"A4A and our member airlines commit to working with government leaders and other stakeholders in a positive partnership to achieve the following stepwise goals"***

- Long-Term: Reduce ***net carbon emissions to zero by 2050 (2050 NZC)***
- Medium-Term: Make 2 billion gallons of cost competitive SAF available to U.S. operators in 2030
- Near-Term: Reaffirm goal to limit net carbon emissions to 2019 levels

**Sept 9, 2021: Raised SAF goal to making *3BG of cost competitive SAF available in 2030 (2030 SAF Goal)***

## A4A carriers led the world

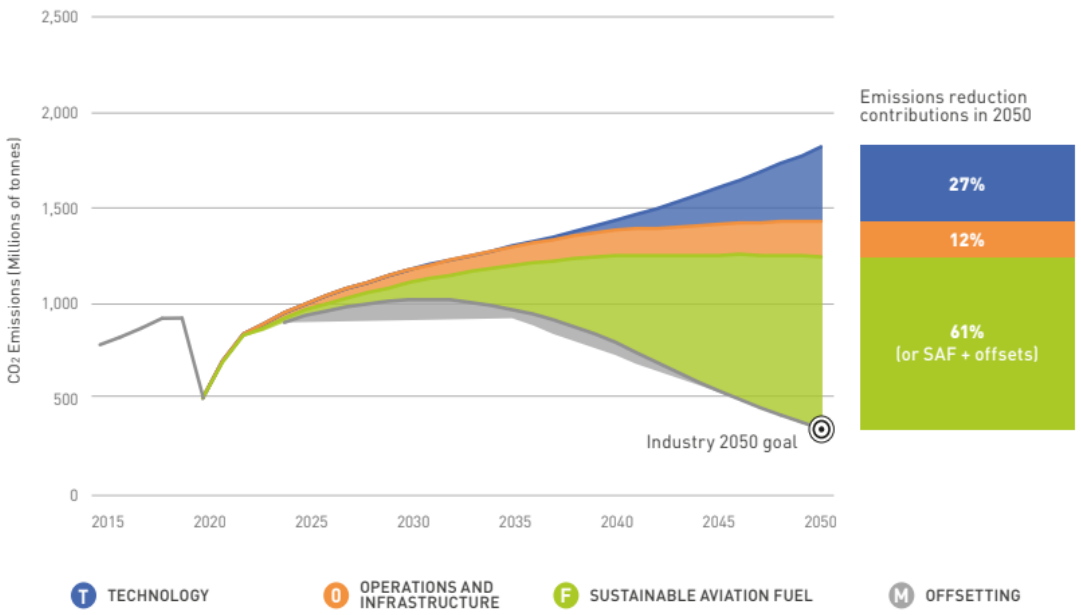
- IATA committed to 2050 NZC in September 2021
- U.S. Aviation Climate Action Plan adopted net-zero GHG goal for sector in November 2021
- UN's International Civil Aviation Organization (ICAO) adopted a 2050 NZC Goal in October 2022

## A4A carriers strengthened their climate commitments during the height of the COVID 19 pandemic and worst economic crisis in its history

- Underscores our carriers' conviction that the long-term economic viability and vitality of the industry *depends on* continually improving sustainability and achieving its 2050 NZC goal

# Decarbonization Will Require "All of the Above" Approach
## *SAF is Mission Critical*

### *The 2050 NZC Goal cannot be met without transitioning from CJF to SAF*




### *Challenge ahead is clear and formidable*

- **Achieving the 2030 SAF goal of 3 BG will require**:
  - A *200-fold* increase from ~15 MG available to carriers in 2022, or roughly *94% increase* each year from 2022
  - Good news: 3-fold increase in availability from 2021 to 2022
- **Achieving the 2050 NZC goal anticipated to require**:
  - ~22-35 BG SAF in 2050 (2019 fuel burn (pre-COVID) ≅ 22BG)
  - Creating SAF production capacity *at least as large* as current capacity to produce petroleum-based fuel (and perhaps as much as twice as large)

Source: ATAG Waypoint 2050 (September 2020)

# Successfully Decarbonizing Aviation Will Require Strong Public-Private Partnership

## Aligned on Top-Line Goals

- USG's Aviation Climate Action Plan set a net-zero GHG goal for the aviation sector (aligning with A4A's 2050 NZC Goal)
- Biden Administration's SAF Grand Challenge: adopted in tandem with A4A's 2030 SAF Goal

## Airlines also doing our part

- Many of our A4A carriers have set goals to meet 10% of their fuel requirements with SAF by 2030; a couple have set a goal of 30%
- Airlines are already taking delivery of SAF from two producers and have initiated offtake agreements or partnership with more than a dozen other producers.
- Airlines are working with their corporate customers to forge innovative agreements that to allocate SAF's Scope 3 emissions value and help finance the cost-premium currently required to acquire SAF.
- United recently announced a program giving their customers the option to contribute to its new Sustainable Flight Fund, which will invest in companies developing SAF technologies.
- Airlines are partnering with investment consortiums to pool risk across multiple investors – for example, American Airlines is an anchor partner of Breakthrough Energy Catalyst, which is working to accelerate the development and commercialization of decarbonization technologies, including SAF.

# Successfully Decarbonizing Aviation Will Require Strong Public-Private Partnership

## Especially grateful to the Administration and Congress for providing much welcome incentives for SAF production in the *Inflation Reduction Act*

- SAF-specific blenders tax credit – 2022 to 2023, $1.25/gal (50% GHG reduction) to $1.75 (100% reduction)
- Clean Fuel Production Credit – 2024-2027, $0.11/gal. (50% reduction), $1.75/gallon (100%)
- Grants for SAF-related projects
  - $244.5 million for projects related to production, transportation, blending and storage of SAF (FAST-SAF)
  - $46.5 million for projects relating to low-emission aviation technologies, including projects that increase SAF use (FAST-Tech)
- Need to augment these (e.g., by lengthening the term of the credits to 10 years) to provide investors with certainty

## Need continued/enhanced funding for FAA and NASA R&D Programs

- FAA
  - Continuous Lower Energy & Emissions Program (CLEEN)
  - ASCENT – Aviation Sustainability Center (aka, Center of Excellence for Alternative Jet Fuels and Environment)
- NASA Aeronautics Research Mission Directorate:
  - Advanced Air Vehicles Program (AAVP); Integrated Aviation Systems Program (IASP); Transformative Aeronautics Concepts Program (TACP); Airspace Operations and Safety Program (AOSP)
  - Sustainable Flight National Partnership: enable 25-30 percent energy efficiency improvements in next-generation transports with the capability to use 100% SAF and fly optimal trajectories. "Centerpiece of the partnership will be a full-scale technology demonstrator X-plane built to test an ultra-efficient aerodynamic design and possibly other new technologies, to solve the challenges of integrating those technologies and proving their predicted benefits in flight."

# Decarbonization Complements and Reenforces Efforts to Reduce LAQ Pollutants

## Even with the transition to SAF, constantly improving fuel-efficiency will remain a key objective of the industry

- ALWAYS been focused on improving fuel efficiency: reducing emissions aligns with economic incentives - fuel is expensive and is historically 1st or 2nd highest cost center
- Will remain a primary focus with SAF: currently SAF is 2-5 times more expensive and even when it becomes cost competitive with conventional fuel, there is an incentive to constantly improve fuel efficiency

## SAF helps reduce emissions of certain LAQ emissions

- Low sulfur content = less SOx
- Reduces PM significantly (lower sulfur and virtually no aromatics): "Sustainable aviation jet fuels showed up to 70% reduction in particle mass emission compared to a fossil fuel"*

  * Aircraft engine particulate matter emissions from sustainable aviation fuels: Results from ground-based measurements during the NASA/DLR campaign ECLIF2/ND-MAX (Fuel; October 1, 2022)

## A4A and members have always supported adoption of increasingly stringent aircraft engine emissions standards though International Civil Aviation Organization (ICAO) for oxides of nitrogen (NOx) and PM

- It is very difficult to address all pollutants (and noise!) at once – there are interdependencies ("tradeoffs"): e.g., designing engines to limit NOx can make it more difficult to improve fuel efficiency (reduce CO2) and PM
- Have supported and will continue to support development of increasingly stringent aircraft/engine standards and incorporation into U.S. law
  - NOx standards have cut allowed emissions by 50%
  - Smoke virtually eliminated long ago; new PM standards based on cutting edge science set foundation more stringent mass and number standards in the future
  - New integrated NOx-PM engine standard possible

Airlines for America®

*We Connect the World*