The U.S. Airlines' Climate Change Initiatives

- The U.S. Airlines' Strong Climate Record
- Our Climate Targets and Initiatives
- The U.S. Airlines' Synergistic Environmental Commitments

December 2019

Airlines for America®
We Connect the World

U.S. Airlines* Facilitate the Safe, Rapid and Carbon-Efficient Movement of People and Goods Worldwide

Over 740,000 **direct employees**

28,000 worldwide **flights** per day

2.4 million **passengers** per day

58,000 tons of **cargo** per day

5 percent of the nation's **GDP**

2 percent of the nation's greenhouse gas emissions

And we're committed to **flying even greener**

Sources: A4A, Bureau of Transportation Statistics and Environmental Protection Agency

* Includes passenger/combination and cargo-only carriers

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Aviation's Strong Climate Change Record

» Aviation Is a Relatively Small Contributor . . .

- Domestic U.S. commercial aviation = 2% GHGs (source: EPA)
- Worldwide aviation = 2% (source: IPCC)

» We Have a Strong Record . . .e.g., U.S. Airlines:

- Improved fuel efficiency over 130% between 1978 and 2018; 5 billion metric tons of CO_2 savings = taking ~26 million cars off the road each of those years

"Today's fleet of aircraft has an average fuel efficiency on par with a modern Toyota Prius hybrid." FAA, Sept. 2019

» But There Are Concerns . . .

- Concerns about potential for emissions growth; "Flight Shaming"

» The Global Aviation Industry Is Working to Address These Concerns

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Global Aviation Climate Action - Emissions Targets and Initiatives

1. **Industry's Emissions Targets**

2. **Key Focus on Technology, Operations, Infrastructure & Sustainable Aviation Fuels Measures**

3. **Implementing 2016 United Nations International Civil Aviation Organization (ICAO) Agreements**

   - ICAO CO_2 certification standard for new aircraft (2020 and 2023 implementation dates)
   - ICAO Carbon Offsetting & Reduction Scheme for International Aviation (CORSIA), emissions monitoring began in 2019, offsetting 2021+

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Driving Emissions Reductions within the Industry

The Industry Is Aggressively Pursuing Advances in All These Areas

1. Technology

- Invest in newer aircraft/fleet enhancements (e.g., winglets)
- R&D for breakthroughs in engines and airframes

2. Operations

- Weight reduction; maintenance (e.g., engine wash), etc.

3. Infrastructure

- Delivering 21st Century air traffic control/NextGen

4. Sustainable Aviation Fuels (SAF)

- Liquid fuels now; electric/hybrid aircraft longer-term

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A Few Words on Technology & Operations

➢ Each Generation of Aircraft Is Approximately 15-20% More Fuel Efficient than Its Predecessor

- With improved finances, U.S. airlines purchased more than 800 new aircraft from 2017-2018, with more than 1,700 additional planes expected in the coming years

➢ Public-Private R&D Programs Are Critical

- FAA-Industry “Continuous Lower Energy, Emissions and Noise” (CLEEN) program
- NASA-Industry Advanced Air Vehicles Program (AAVP) and Transformative Aeronautics Concepts Program (TACP)
- FAA-NASA-Industry-Aviation Sustainability Center (ASCENT)

A Few Words on Infrastructure: NextGen

NextGen Is Necessary & Highly Beneficial

- Necessary to maintain and enhance safety
- Critical to U.S. competitiveness
- Reduces delays
- Enables further fuel and emissions reductions (climate and local impacts)
- Can and often does decrease net noise exposures
  - The aviation industry has been working to address impacts from revised procedures that can change noise exposures

NextGen Was Originally Projected to Bring up to 12% Emissions Savings (Low End Estimate Was 5%)

- But FAA's implementation of NextGen has been slow and not delivered significant benefits
- Even a 5% savings in 2018 would have brought almost 10 million metric tons of CO_2 savings, equivalent to taking over 2.1 million cars off the road for one year

What Airlines Need to Deploy Sustainable Aviation Fuel (SAF)

1. **Above All, Safety – This is Addressed Through:**
   - The jet fuel specification, ASTM D7566; and
   - Application of procedures to assure fuel quality is maintained

We have accomplished this

2. **Environmental Benefit – This is Addressed Through:**
   - Lifecycle greenhouse gas emissions assessment (LCA), benefits up to 80%; and
   - Sustainability review/certification

Established protocols for this

3. **Commercial Viability**
   - Need cost competitiveness; and
   - Supply scale up and reliability

Progress, but remains the biggest challenge

Policy Progress Supporting Commercialization

The U.S. Aviation Industry Has Worked in Coalitions to Advance SAF

➢ Key Coalitions:

- Commercial Aviation Alternative Fuels Initiative (CAAFI)
- Farm-to-Fly and Strategic Alliance with the U.S. Military
- Center of Excellence for Alternative Jet Fuels and Environment (i.e., the "Aviation Sustainability Center" (ASCENT))

➢ Policy Progress:

- U.S. Defense Production Act Helped Two U.S. SAF Producers
- U.S. Renewable Fuel Standard Credits SAF on a Voluntary, "Opt-in" Basis
- 5 Approved SAF Pathways under the Jet Fuel Specification, with More in Progress
- Voluntary "Opt-in" Eligibility for SAF in the California and Oregon Clean Fuels Programs

A4A Carrier Supply and Deployment Agreements

Starting with Millions of Gallons; Key Step to Scale-Up

United	+	World Energy	= 1-2M gpy 2016-19 5-10M gpy 2020-21
United	+	Fulcrum BioEnergy	= 90-180M gpy, over 10 years
Southwest	+	Red Rock Biofuels	= 3M gpy
FedEx	+	Red Rock Biofuels	= 3M gpy
jetBlue	+	SG Preston	= ~10M gpy for 10 years*
Alaska Airlines / American Airlines	+	Neste	= MOUs for potential future supply

Atlas, Hawaiian and UPS also engaged with flights and other initiatives

*33 million gpy as blended, with 30% renewable fuel content

Progress . . .But Still Challenges

Mechanisms to Scale Up and Enhance Cost-Competitiveness Are Still Lagging

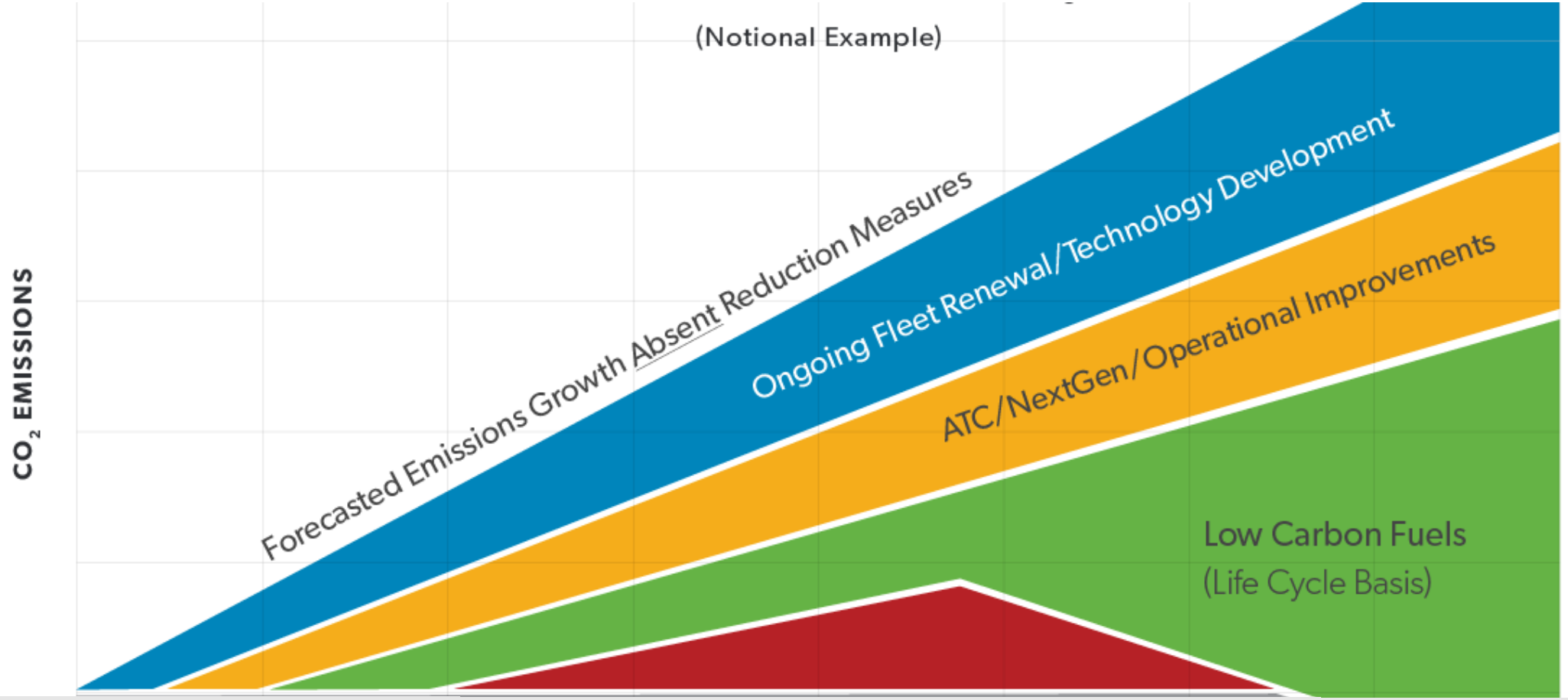
- SAF is still very expensive and scale-up takes time
- Policies under threat: need stable alternative fuels programs
- Funding: U.S. agencies' budgets are threatened
- Tax incentives: e.g., currently none for SAF specifically; and the $1/gallon federal tax credit for fuel blenders expired (in tax extenders package)
- Positive support is good (e.g., tax incentives; loan guarantees; grant programs for promising technologies) – mandates are not (unlike for ground-based alternative fuels, still an immature market)

A4A Has Published a SAF Deployment "Primer" to Serve as a Reference

http://airlines.org/media/deployment-of-sustainable-aviation-fuel-in-the-united-states/

CORSIA – A Complement to Technology, Operations, Infrastructure and Sustainable Aviation Fuels (SAF)

To Support Achieving Carbon Neutral Growth in Aviation from 2020



EMISSIONS REDUCTIONS **2021** ICAO CORSIA OFFSETTING **2035** **2050**

ICAO & Industry Goals CNG2020+

Industry Goal Net 50% ↓

ICAO CORSIA – First & Only Global Market-Based Measure

- Global Carbon Offsetting Scheme, 2021-2035, Supports Achieving CNG2020 Goal
- Applies to International Aircraft Operators
- All Operators Were Required to Monitor & Report CO_2 Emissions for International Flights as of 1-1-19
- 2021-2026: Country Opt-In Basis (81 Countries so Far, 77% of total international emissions); 2027+ Mandatory
- Credit for Operators Using SAF

ICAO Has Established Rigorous Emissions Units Criteria (EUC)

For Tapping into the Existing Carbon Market under Agreed Rules

» **Criteria for the Emissions Units Programs and for Projects/Credits Generated under Them**

- Carbon programs must meet 11 design elements for the program to be eligible under the ICAO offset system; and
- Carbon emissions units generated by projects under the programs must meet 8 eligibility criteria (i.e., "Carbon Offset Credit Integrity Assessment Criteria")

» **19-State Technical Body Will Apply the EUC to Determine which Offsets Qualify**

ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

ICAO document

CORSIA Emissions Unit Eligibility Criteria

March 2019

https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Emissions-Units.aspx

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Opportunities & Challenges

- The Industry Is Working Together to Drive Solutions
- Public-Private Partnerships Are Critical
- Coordination Is Essential
- Industry Revenue Supports Investments
- Need Complementary, Stable Regulatory Programs

A Word About the U.S. Airlines' Synergistic Environmental Commitments

» Strong Environmental Record . . .

- 2% of man-made CO_2, while 5% of the GDP; and we have an aggressive climate commitment going forward
- 94% reduction in significant noise exposures 1975 to 2018, while enplanements rose 359%
- Carbon monoxide and smoke virtually eliminated, and oxides of nitrogen from aircraft continually reduced
- Completed voluntary program for aircraft deicing (on top of regs)
- Extensive recycling and other sustainability initiatives

» And We Are Focused on Continuing and Improving on that Record . . .

If You Want to Feel Good About the Future, Look Up!

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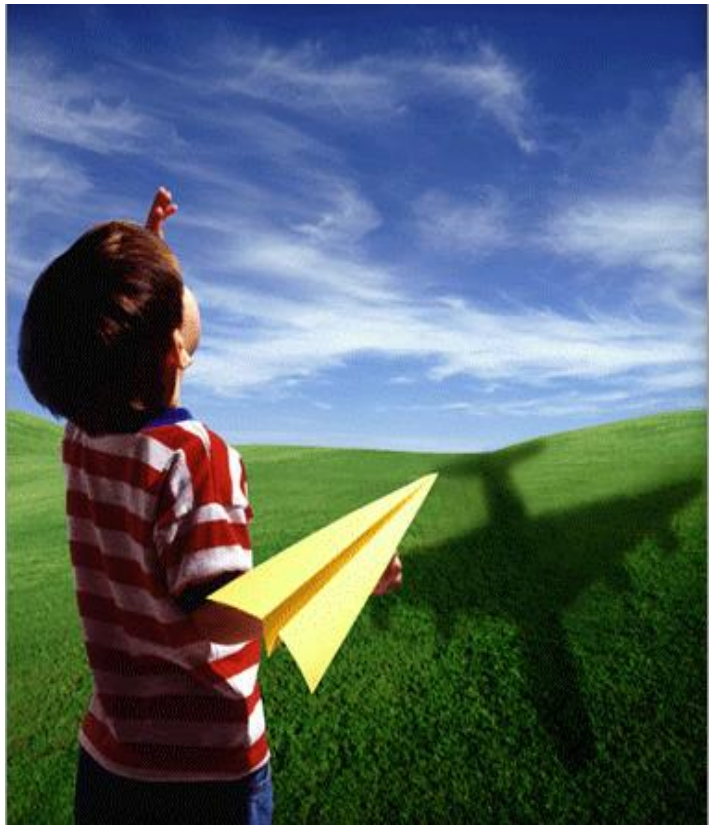

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