

Aviation's Climate Action Strategy

Boeing and the aviation industry recognize that climate change is a fundamental challenge of our time—and we're united in fulfilling our commitment to reduce CO₂ emissions. We've made substantial progress, but there's more work to do as more people fly and emissions continue to grow.

Boeing and the industry are reducing emissions in four key ways



1 Technology

- **Each generation of new airplanes is 15% to 25% more efficient.** Improvements come from new engines, lighter-weight carbon composite airframes, and aerodynamic innovations like natural laminar flow that reduces drag.
- **Boeing technology investments and innovations** today enable the next generation of airplanes—major derivatives or an all-new airplane.
- **The ecoDemonstrator program supports** technology readiness for new airplanes through full-scale flight demonstrations of promising innovations.



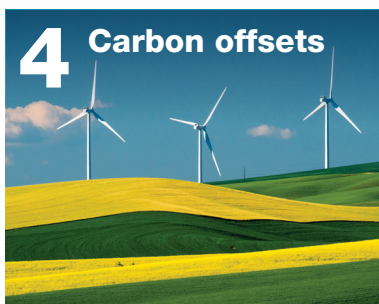
2 Operations & Infrastructure

- **Data analytics help airlines** optimize flight planning.
- **Real-time information enables pilots** to make adjustments as weather and traffic conditions change.
- **Boeing works with air navigation service providers** on procedures such as continuous descent approaches—and on infrastructure upgrades to implement GPS-based navigation for more efficient flying and airspace usage.
- **Higher load factors, slim-line seats, and upgauging** also contribute to improved efficiency.



3 Sustainable aviation fuels

- **Sustainable fuel reduces life-cycle emissions** by up to 80% for current and future airplanes.
- **These fuels can be made from plants,** agricultural and forestry waste, municipal waste, and other sources.
- **Sustainable fuel is proven** and used every day—by airlines that buy it on their own and at four airports where it's regularly offered. No changes are needed to airplanes, engines, or fueling infrastructure. Boeing works around the world with airlines, fuel producers and governments to expand the very limited current supply.



4 Carbon offsets

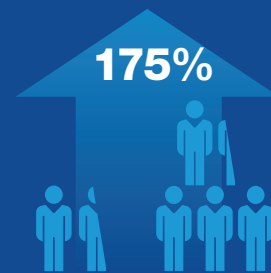
- **Every nation in the world adopted** the Carbon Offsetting and Reduction Scheme for International Aviation in 2016. CORSIA is being implemented now to help reduce growth in emissions as work on the other three areas advances.
- **Several airlines are also offsetting** some or all of their domestic and international emissions beyond CORSIA's requirements. Air France, British Airways and jetBlue committed to offset their respective domestic emissions in 2020. easyJet committed to offset all of its emissions starting this year. Delta stopped its CO₂ growth starting in 2012 through the purchase of offsets.



Aviation produced about
2% of global emissions
before COVID-19.



80%
comes from travel
where there are **no practical alternatives** (flights longer than 800 nm/1,500 km).



1999
1.6B

2018
4.3B

Industry efforts kept aviation's share of global emissions at about 2% before COVID-19 while demand nearly tripled.

But overall emissions were growing. Boeing and the industry remain committed to meeting aviation's climate goals to ensure air travel recovers sustainably and we earn our license to grow again.

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As part of its commitment to reduce CO₂ emissions, aviation became the first industrial sector to voluntarily set three ambitious environmental goals in 2008. Boeing—along with airlines, airports, air navigation service providers and other manufacturers—are working together to meet these targets.

How Boeing and the industry are achieving these goals

GOAL

1

1.5%

ANNUAL FLEET
FUEL EFFICIENCY
IMPROVEMENT
from 2009 to 2020

ACHIEVED

- **Airplane and operational investments** have enabled the industry to exceed this goal with an average annual improvement of 2.1% since 2009 (fuel consumption per passenger kilometer).
- **Boeing and other airplane and engine OEMs spend \$15 billion / €13.8 billion a year** on R&D to improve aircraft efficiency.
- **Airlines spent \$1 trillion / €917 billion** to buy over 15,000 new, more efficient aircraft—many to replace older jets—since 2009.
- **Airline operational efficiency** contributes significantly through greater seating utilization, fuel conservation programs, and other efforts.

GOAL

2

0%

STABILIZE
AVIATION'S NET CO₂
EMISSIONS GROWTH
from 2020 onward

IN WORK

- **Continued deployment of new generation airplanes** will reduce the growth rate of CO₂ emissions, but forecasts indicate overall emissions will increase. Offsets are necessary to fill the gap.
- **Airlines flying between participating countries** must buy CORSIA offsets. That's 75% of international traffic in 2021 and 90% in 2027 (pre-COVID-19 numbers).
- **Carbon offsets must meet strict** environmental eligibility criteria in order to receive credit.
- **Sustainable aviation fuels will contribute** by reducing airline offset purchases. Boeing has been an industry leader in advancing biofuels. Seven production pathways have been approved in less than a decade.

GOAL

3

50%

REDUCE
AVIATION'S NET CO₂
EMISSIONS
to 2005 levels by 2050

IN WORK

- **Biofuels are key** to long-term, large-scale emissions reductions that airplane technology cannot achieve.
- **Government support and incentives are critical** to foster widespread commercial-scale production of price-competitive sustainable fuel supplies. Supply growth pace is the limiting factor in reducing emissions.
- **Electric power shows promise** for smaller, shorter-range airliners. Boeing and others are developing prototypes that could be flying in the 2030s.
- **But this technology is likely decades away** for airplanes the size and range of a 737 and larger. Storage technology and the fleet-penetration rate limit electric power's potential contribution until the 2050s.

1990 Now



1/2

Per passenger emissions

Aviation's efforts have significantly reduced the CO₂ emissions each of us create on a flight today compared to the same flight 30 years ago.



A super-efficient airliner

With its carbon composite airframe and highly efficient engines, the 787 Dreamliner family has saved

48 billion
pounds of fuel
since entering service
in 2011.

That's enough to take over
16 million
cars off the road
for a year.