Introduction to Sustainability

EASA Sustainable Pilot Training Webinar

14-Jun-22

Peter Hind

RDC

Introduction

About

Chief Executive
Co-founder (2007)
Product and Data Strategist

Core Knowledge

- Airline Strategy
- Airline Business Models
- Pricing and Revenue Management
- Regulation
- Airport Pricing and Revenue
- Network Development
- Demand Forecasting
- Capacity Planning
- Commercial Due Diligence
- Sustainability

Aviation Economics

Director
Consultant
Forecaster

Visiting Lecturer
Sustainable Aviation
2009 - present

British Midland

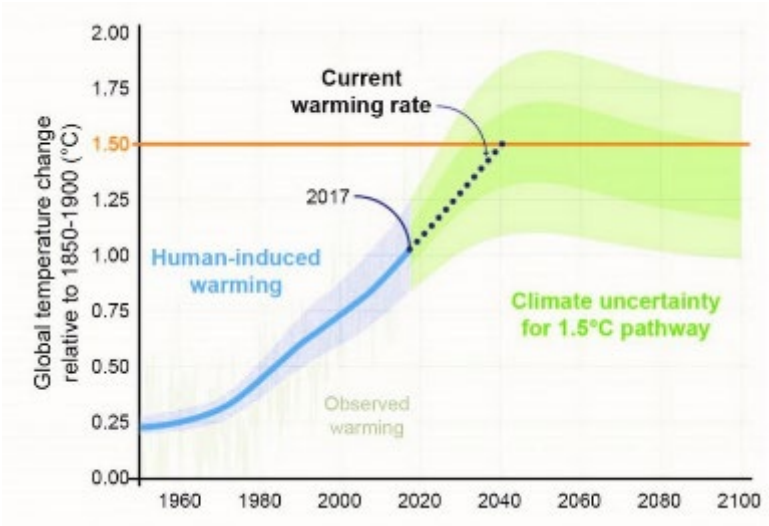
Senior Manager Airline Partnerships
Interline Pricing Manager

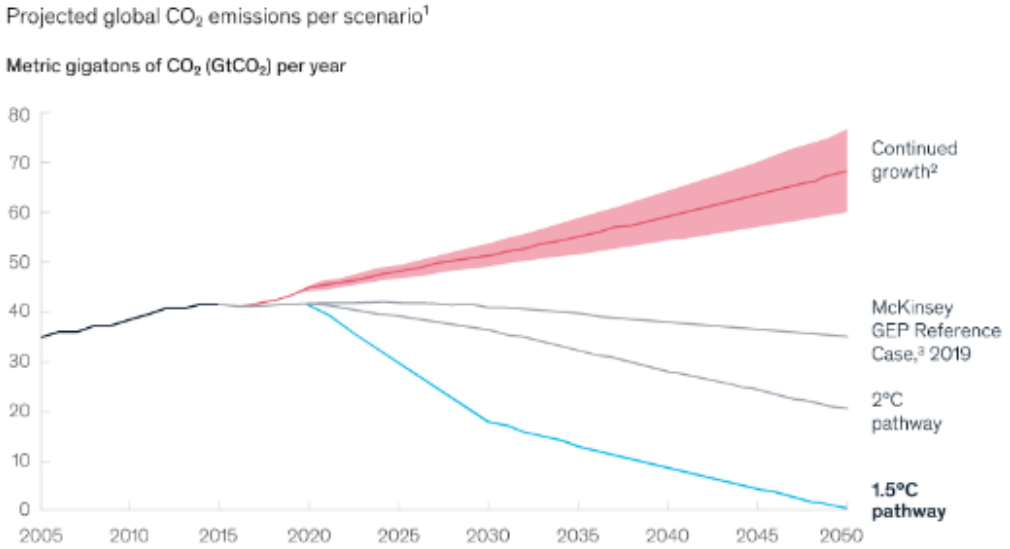
“Sustainability” is alive!

- A rare crossroads where air transport is part of a wider global effort to combat climate change, sustainability is the most rapidly evolving topic in the industry
- Multiple touch-points shaping the next generation of developments
  - Airports, noise and ground emissions
  - Airline carbon and other GHG emissions
  - OEMs
  - Regulators, policy makers
  - Training approaches
  - Corporates and investors
  - Consumer preference

Why the need to reduce emissions?

- Multiple studies across many indicators show evidence the climate is changing
  - Atmospheric concentration of CO2 is increasing, trapping heat which is leading to sea and air temperature increasing, arctic ice minima reducing, sea level rising, extreme weather events etc
- Without aggressive measures across multiple sectors, we are heading into a very uncertain future
- **Governments and regulators are committed to reducing emissions**

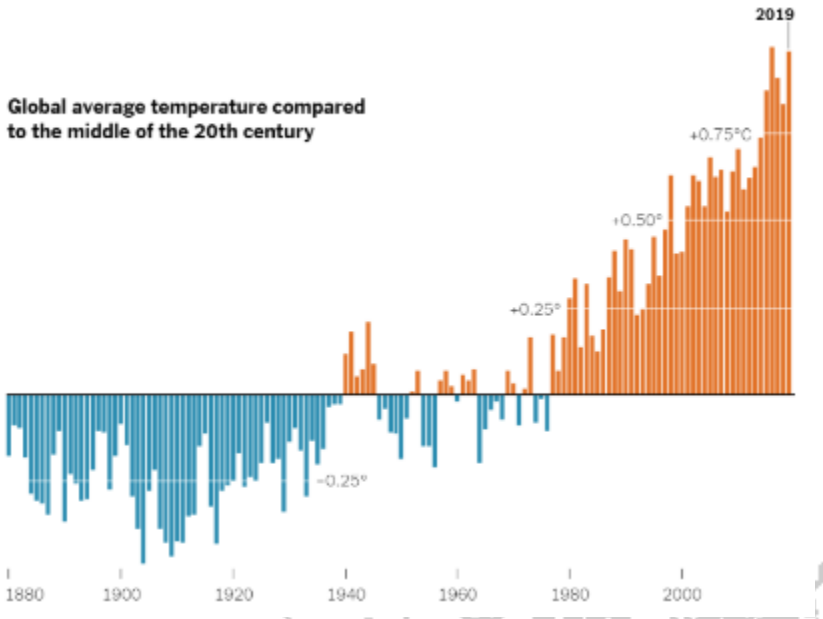


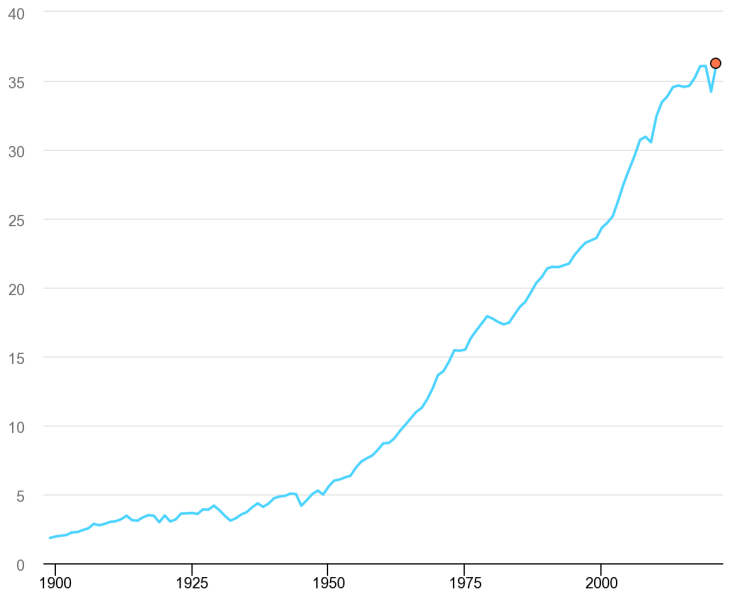


Source: IPCC (left) and McKinsey (right) https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-math-what-a-1-point-5-degree-pathway-would-take

Global CO2 Emissions 1900 to 2021

- To limit global warming to 2% or below requires serious action
- 2020 saw a fall in CO2 emissions for the first time since 2008 and by the most significant amount since records started
- But overall emissions remained higher than 2009 and have begun to climb again





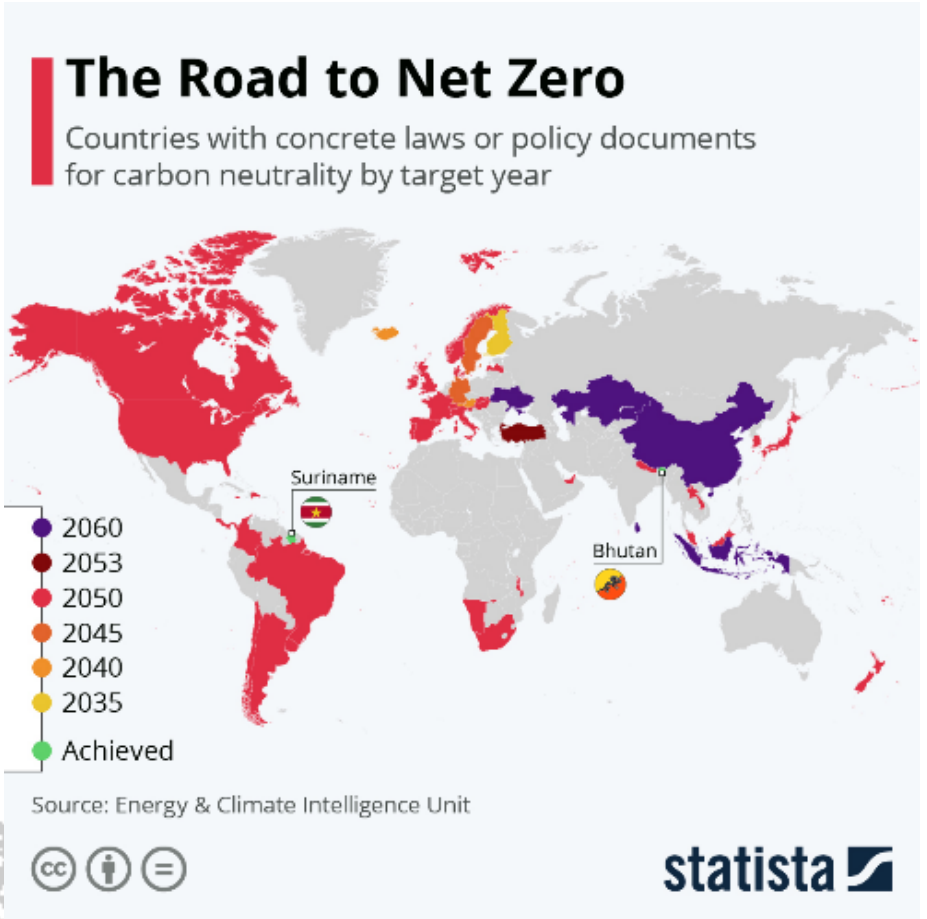
IEA, CO2 emissions from energy combustion and industrial processes, 1900-2021, IEA, Paris
https://www.iea.org/data-and-statistics/charts/co2-emissions-from-energy-combustion-and-industrial-processes-1900-2021

RDC

Net Zero and why it matters

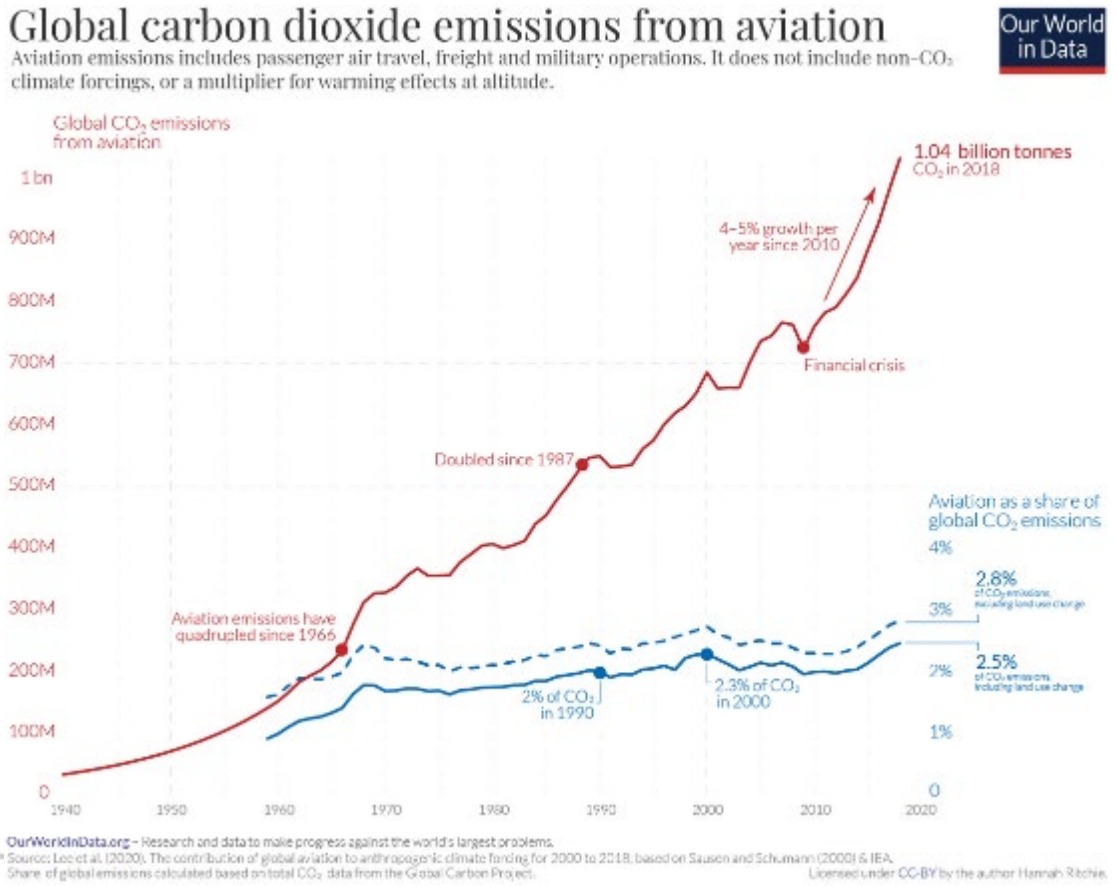
What is *Net Zero*?

- *Net Zero* has become a commonly used phrase in relation to climate policy
- It is an aiming point where the *amount of CO2 emitted* into the atmosphere minus *the amount of CO2 removed* equals **zero**
  - Net zero doesn't mean zero emissions
  - But any emissions need to have an equivalent removal mechanic (and removal is difficult)
- Most of the world's major emitting nations have committed to a timeline to achieve net zero
  - Including legally binding policy frameworks



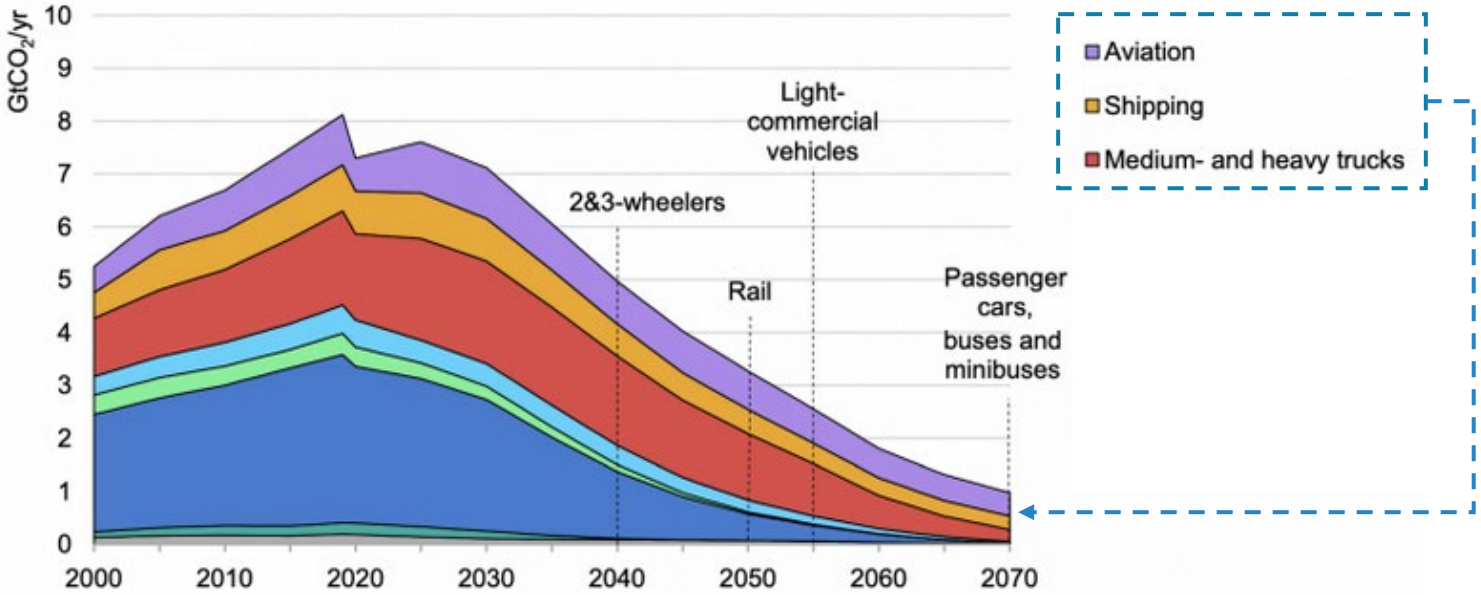
Spotlight on aviation

- Despite a decade of awareness and discussion, emissions from global air transport have continued to grow at over 4% per annum and are slowly becoming a greater proportion of the world's total CO2 inventory



Transport Emissions since 2000

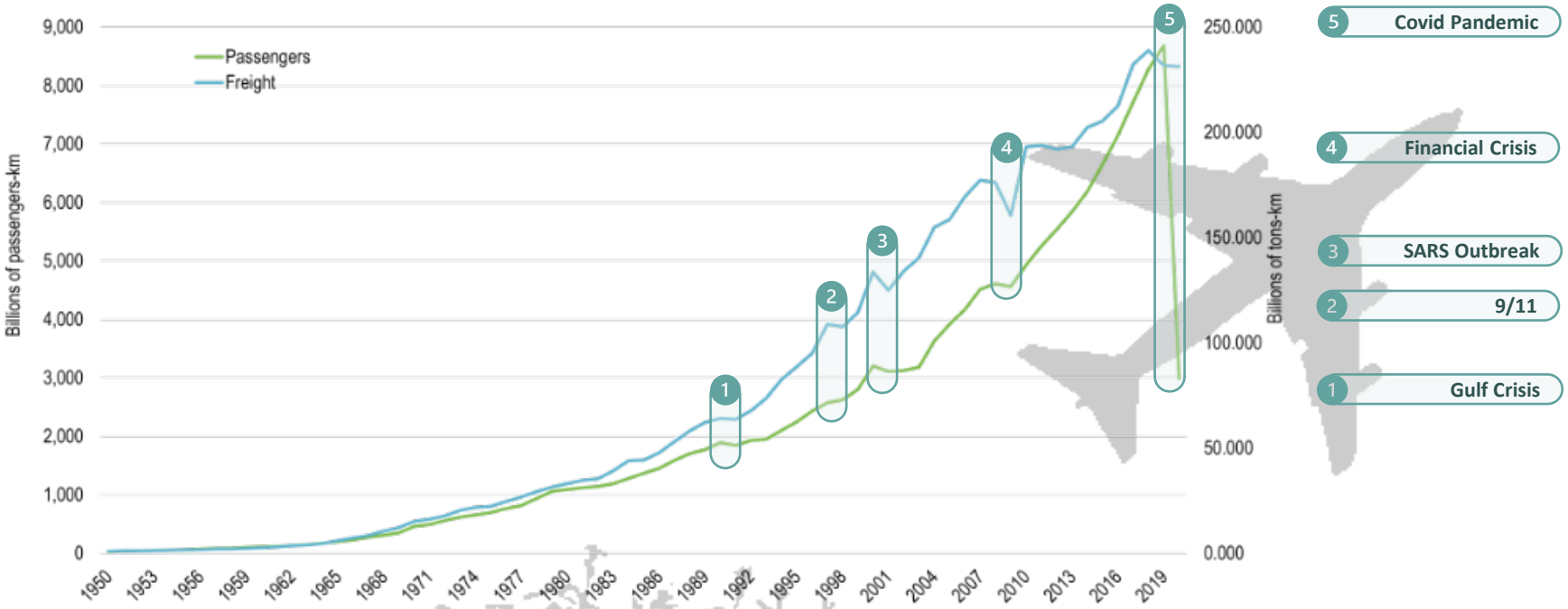
- Transport emissions increased by 60% this century, up to the pandemic, driven primarily by road vehicle emissions
- Aviation emissions have grown steadily and account for about 12% of all **transport** emissions today
- However, the sector is the hardest to de-carbonise, which could lead to flying accounting for a much greater proportions of transport emissions in the future



Source: https://ourworldindata.org/co2-emissions-from-transport

Growth in Air Transport

- Passenger traffic and freight tonnage is resilient to shocks and generally correlates with GDP
- Growth in flight activity leads to an increase in fuel burn and CO2 emissions



Source: Airlines for America, IATA, RDC

The Growth Equation

ENABLERS

Demand Side

- National / international GDP
- Disposable income
- "Desire" to fly
- Historic trade links
- Historic VFR links
- Price/cost

Supply Side

- Slots
- Aircraft
- Seat capacity

INHIBITORS

Demand Side

- **Policy**
- Protectionism
- **Taxation**
- Economic uncertainty
- **Cost**

Supply Side

- Capacity
- Congestion
- Skills shortages
- Aircraft availability

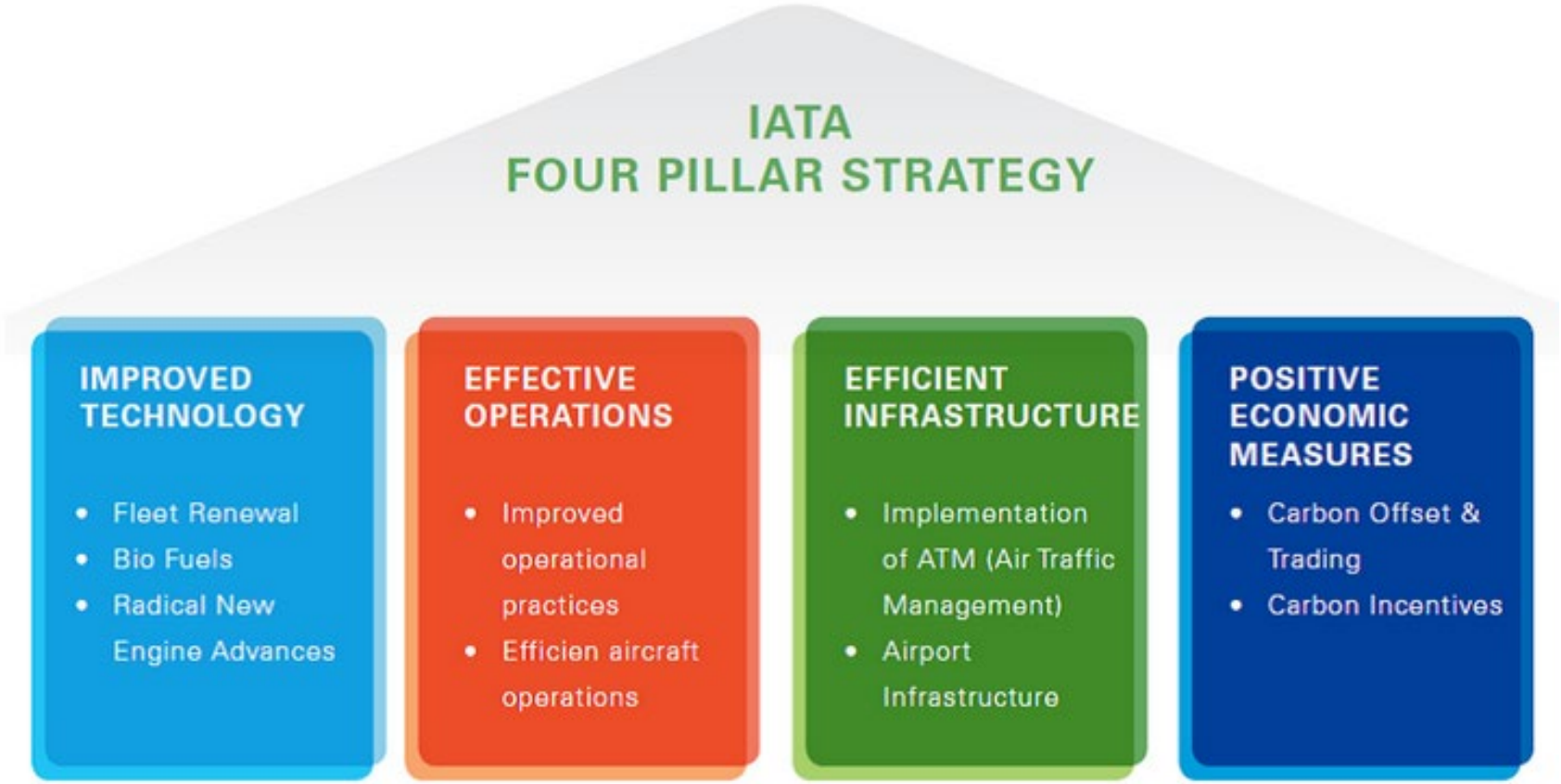
RDC

IATA and ICAO

- ICAO (UN Agency) and IATA (airline trade association) moved slowly in the 2010s, playing catch-up now
- IATA goals for the industry:
  - **1.5% p/a fuel efficiency** programme 2009 to 2020
  - **Carbon neutral** growth from 2020
  - **50% reduction** in CO2 by 2050 versus 2005 baseline
    - Revised to **Net Zero by 2050** in late 2021
  - Support CORSIA
- Implementation of a **global CO2 certification standard** for aircraft
- A four pillar strategy
  1. Technology
  2. Infrastructure
  3. Operations
  4. Economic Measures



How to do it?


IATA
FOUR PILLAR STRATEGY
IMPROVED TECHNOLOGY
• Fleet Renewal
• Bio Fuels
• Radical New Engine Advances
EFFECTIVE OPERATIONS
• Improved operational practices
• Efficien aircraft operations
EFFICIENT INFRASTRUCTURE
• Implementation of ATM (Air Traffic Management)
• Airport Infrastructure
POSITIVE ECONOMIC MEASURES
• Carbon Offset & Trading
• Carbon Incentives

Source of Emissions

- **Almost entirely through aircraft fuel burn**
  - Burning fossil fuel creates (among other things) CO2, NOx, soot, particulate emissions, water vapour etc
  - 1 tonne of JetA/A1 emits 3.15 tonnes of CO2 (referred to as t/CO2e)
  - Debate over the effects of non CO2 emissions such as
    - High altitude effects
    - Contrails
    - Particulates and oxides of nitrogen
  - Radiative Forcing Index (RFI) can be applied as a multiplier to CO2 emissions to account for the non-CO2 effects

Options for Cutting Emissions

1. **Compensate**

   Continue producing CO2 and use offsets to cover the annual emissions

   - *Within aviation this means voluntary or compliance-led offsetting*

2. **Substitute**

   Continue with emission-generating activities but switch to lower carbon materials or process, e.g. alternative fuels

   - *Within aviation this means use of sustainable alternative fuels (SAF)*

3. **Reduce**

   Reduce emissions through change of process or business model

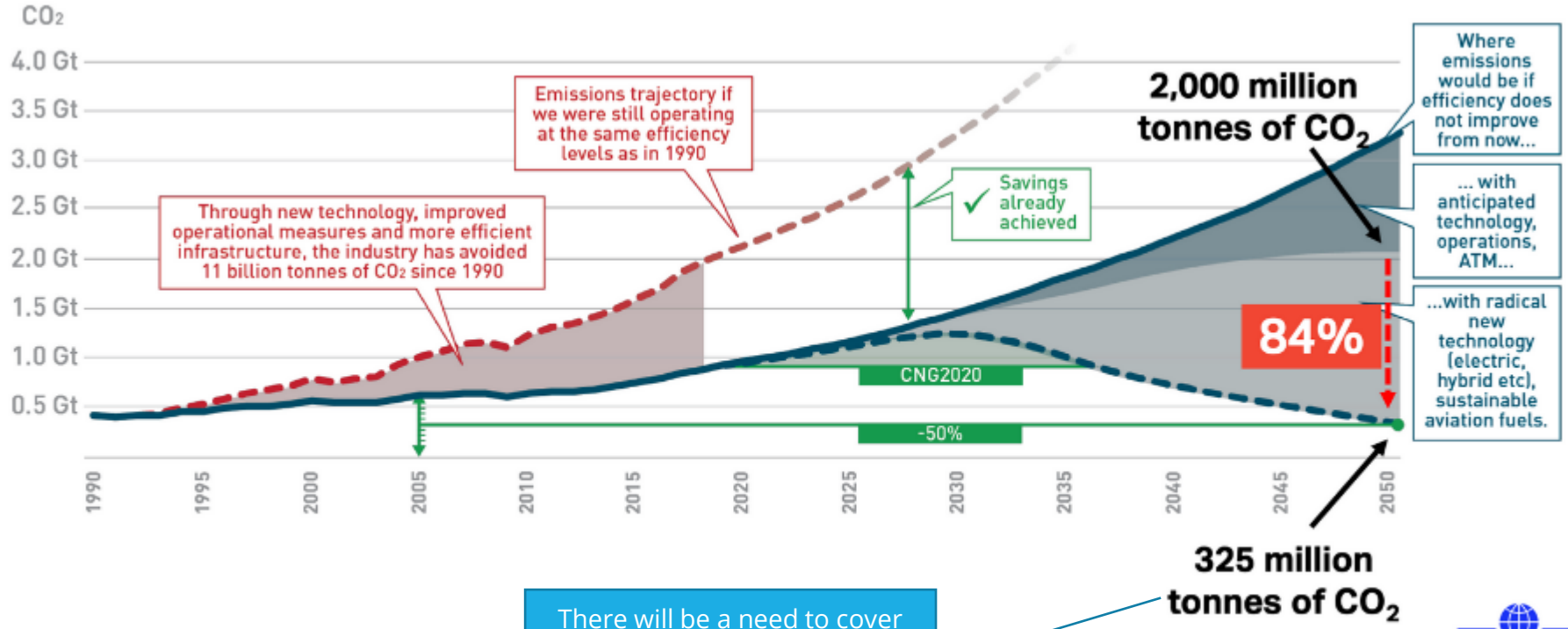
   - *Within aviation this means flying more efficiently, flying less or use of completely new technology*

RDC

IATA Four Pillar Strategy

	Compensate	Substitute	Reduce
Technology			
Operations			
Infrastructure			
Economic			

How to hit Net Zero in 2050



There will be a need to cover the remaining emissions with offsets/carbon storage, direct air capture or other technologies

Source: IATA / ATAG

How can Fuel Efficiency be improved?

5 Key Drivers:

1. Aircraft fuel economy (i.e. technology / performance)
2. Seat density
3. Passenger load factor (PLF / SLF)
4. Freight share
5. Flight distance

How to ‘increase’ fuel efficiency

Trip Fuel: **46t**
Trip CO2: **144t**

British Airways B777-200

First 14 Business 48 Premium 40 Economy 122 = 224

Per Seat**: 642kg**
Per Pax: **803kg @ 80%**

Emirates B777-200ER

First 12 Business 42 Economy 236 = 290

Per Seat: **496kg**
Per Pax: **584kg @ 85%**

Image source: Seatguru

RDC

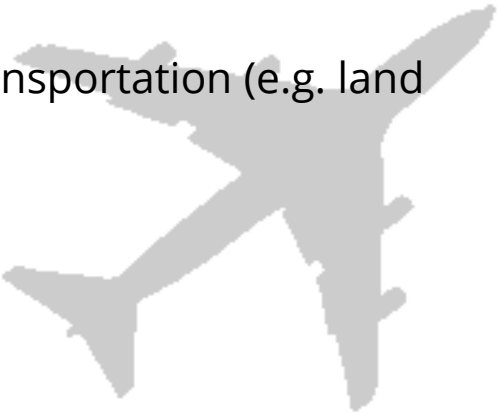
Compensation Options

- Passenger voluntary offsetting
- Corporate offsetting
- Participation in an emissions trading scheme
    - Usually legally mandated
    - EU ETS and CORSIA are the major emissions schemes in place today
        - EU ETS is a trading scheme
        - CORSIA is an offset scheme

Substitution Options

Sustainable Alternative Fuels (SAF)

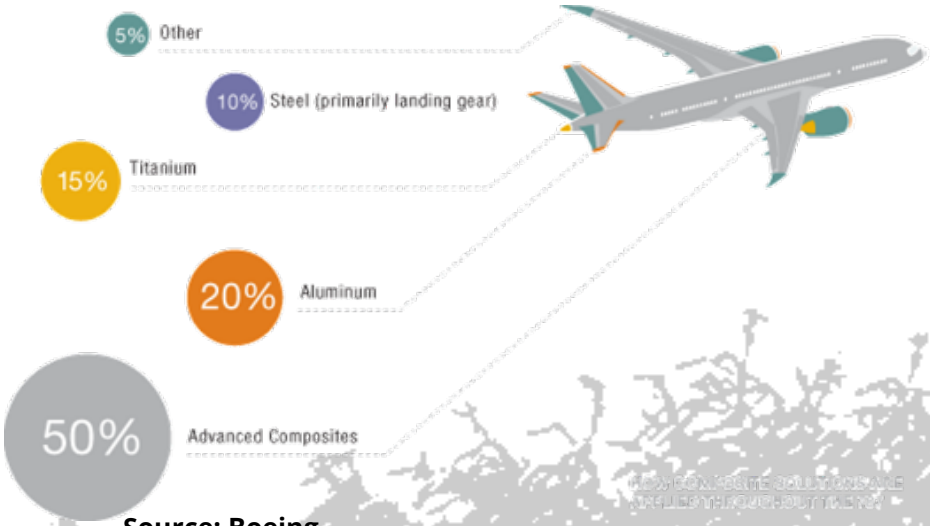
- Cleaner than Jet Kerosene, up to 80% lower emissions
- Local availability – less transportation, less geo-political risk
- Possible ecological and social benefits
- Potentially more stable prices
- Smaller scale for aviation than for other modes of transportation (e.g. land transportation)
- …but challenging. Must have:
  - Drop-in properties – interchangeability with JetA/A1
  - Compatibility with airframe and engines, fuel farms etc
  - Scalability to produce large quantities
  - Similar price-point
  - Certification



RDC

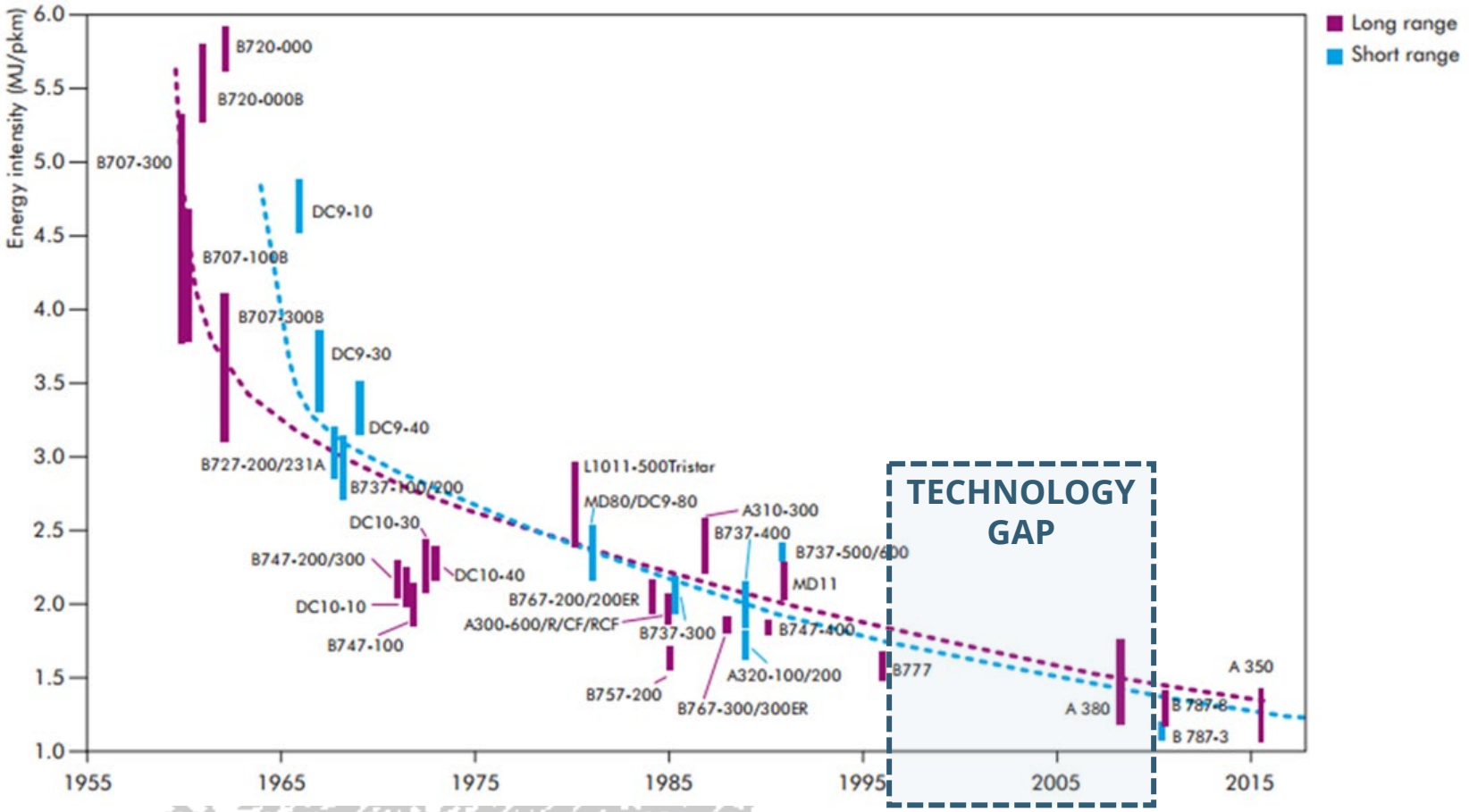
Technology Options

- Laminar flow control technology (natural and hybrid)
- Active load alleviation and variable aerodynamic camber
- Winglets and riblets
- Structural health monitoring
- Composite structures for wings and fuselage
- Engine architectures: geared turbofan, advanced turbofan, open rotor



Source: Boeing

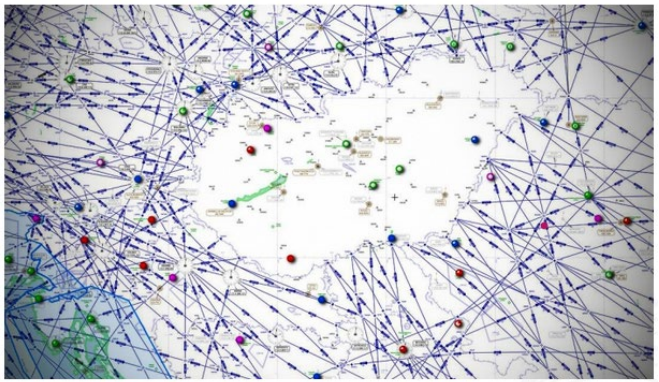
Aircraft Fuel Economy Improvements



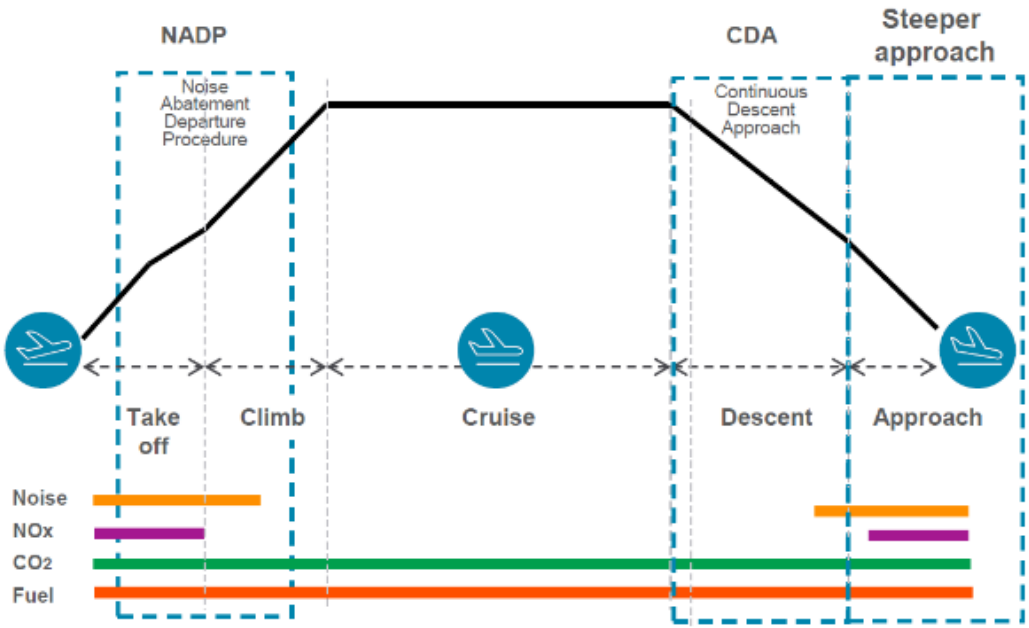
Operations

- Airport operations
  - Single engine taxi
  - Low emissions ground power (FEGP, eGPU)
  - Taxi-bots and other e-vehicles
- Fleet Upgrade
  - Completely new aircraft
  - Retrofits to existing airframes
    - Winglets, sharklets, raked wingtips
    - Drag reducing coatings, riblets, graphic films
    - Zonal dryers
- Climate friendly routings

Infrastructure Improvements



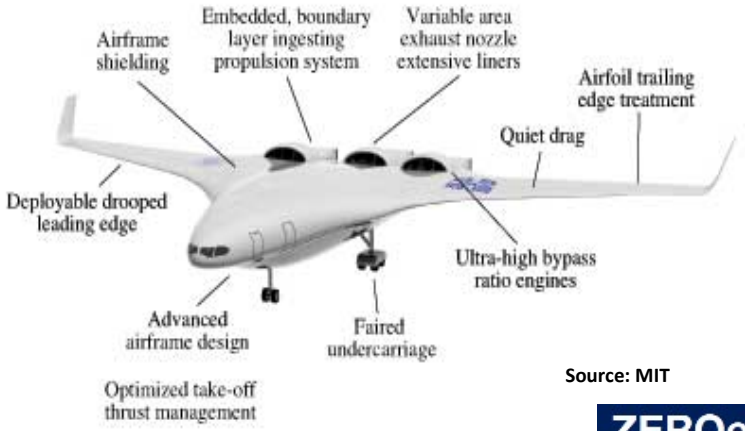
(Source: skyvector.com)



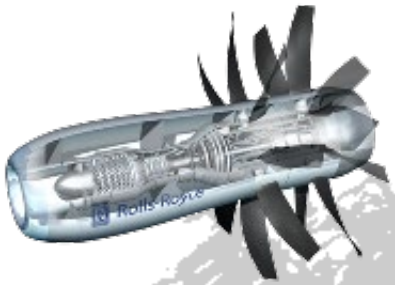
Radical Technologies

- Everything is under evaluation from blended wing and open-rotor to electric and hydrogen propulsion systems

Heart Aerospace



Source: MIT



Timeline for Change

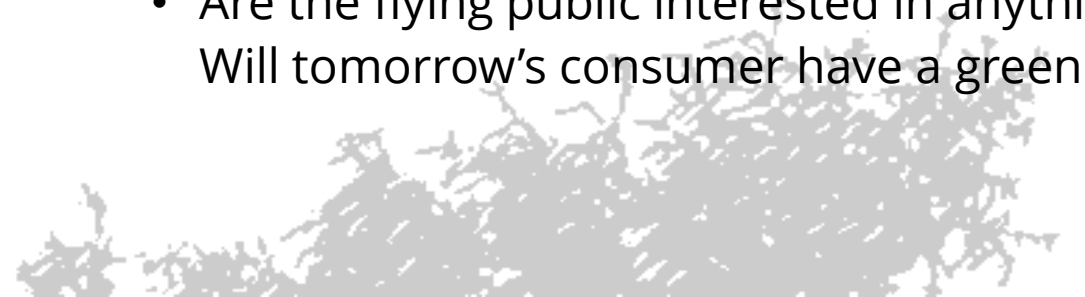
	2020	2025	2030	2035	2040	2045	2050
Commuter » 9-19 seats » < 60 minute flights » <1% of industry CO_2	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Regional » 50-100 seats » 30-90 minute flights » ~3% of industry CO_2	SAF	SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF	Electric or Hydrogen fuel cell and/or SAF
Short haul » 100-150 seats » 45-120 minute flights » ~24% of industry CO_2	SAF	SAF	SAF	SAF potentially some Hydrogen	Hydrogen and/or SAF	Hydrogen and/or SAF	Hydrogen and/or SAF
Medium haul » 100-250 seats » 60-150 minute flights » ~43% of industry CO_2	SAF	SAF	SAF	SAF	SAF potentially some Hydrogen	SAF potentially some Hydrogen	SAF potentially some Hydrogen
Long haul » 250+ seats » 150 minute + flights » ~30% of industry CO_2	SAF	SAF	SAF	SAF	SAF	SAF	SAF

Source: ATAG

RDC

Summary

- Air transport growth correlates with global GDP and despite the crisis in 2020, substantial future growth very likely
- Relatively limited options to reduce fuel burn (and therefore emissions) in the short-term – mostly about **efficiency**
- For some flight segments, particularly intercontinental long-haul, the only option to reduce emissions is probably SAF
- Without radical technologies, at some stage growth is likely to slow down as flying becomes more expensive
- Long term approach needed to noise, local air quality and carbon emissions
- Are the flying public interested in anything other than a cheap fare? Will tomorrow's consumer have a greener outlook?



RDC

Thank You