Introduction to Sustainability

EASA Sustainable Pilot Training Webinar
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Introduction
About

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
“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
  o Airports, noise and ground emissions
  o Airline carbon and other GHG emissions
  o OEMs
  o Regulators, policy makers
  o Training approaches
  o Corporates and investors
  o 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**

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
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.

The Road to Net Zero

Countries with concrete laws or policy documents for carbon neutrality by target year.

Source: Energy & Climate Intelligence Unit
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

<table>
<thead>
<tr>
<th><strong>ENABLERS</strong></th>
<th><strong>INHIBITORS</strong></th>
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<tr>
<td><strong>Demand Side</strong></td>
<td><strong>Demand Side</strong></td>
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<td>• National / international GDP</td>
<td>• <strong>Policy</strong></td>
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<td>• Disposable income</td>
<td>• Protectionism</td>
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<td>• “Desire” to fly</td>
<td>• <strong>Taxation</strong></td>
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<td>• Historic trade links</td>
<td>• Economic uncertainty</td>
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<td>• Historic VFR links</td>
<td>• <strong>Cost</strong></td>
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<td>• Price/cost</td>
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<td><strong>Supply Side</strong></td>
<td><strong>Supply Side</strong></td>
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<td>• Slots</td>
<td>• <strong>Capacity</strong></td>
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<td>• Aircraft</td>
<td>• Congestion</td>
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<tr>
<td>• Seat capacity</td>
<td>• Skills shortages</td>
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<td>• Aircraft availability</td>
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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:
  o 1.5% p/a fuel efficiency programme 2009 to 2020 •
  o Carbon neutral growth from 2020
  o 50% reduction in CO2 by 2050 versus 2005 baseline
    • Revised to Net Zero by 2050 in late 2021
  o 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
- Efficient 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*
## IATA Four Pillar Strategy

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<tr>
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<th>Compensate</th>
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<th>Reduce</th>
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<tr>
<td>Technology</td>
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<td>Operations</td>
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<td>Infrastructure</td>
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<td>Economic</td>
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<td>Yellow</td>
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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.
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

British Airways B777-200
First 14 Business 48 Premium 40 Economy 122 = 224

Emirates B777-200ER
First 12 Business 42 Economy 236 = 290

Image source: Seatguru
Compensation Options

• Passenger voluntary offsetting
• Corporate offsetting
• Participation in an emissions trading scheme
  o Usually legally mandated
    o 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:
  o Drop-in properties – interchangeability with JetA/A1
  o Compatibility with airframe and engines, fuel farms etc
  o Scalability to produce large quantities
  o Similar price-point
  o Certification
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
  o Single engine taxi
  o Low emissions ground power (FEGP, eGPU)
  o Taxi-bots and other e-vehicles
• Fleet Upgrade
  o Completely new aircraft
  o Retrofits to existing airframes
    • Winglets, sharklets, raked wingtips
    • Drag reducing coatings, riblets, graphic films
    • Zonal dryers
• Climate friendly routings
Infrastructure Improvements
Radical Technologies

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

*Source: MIT*
## Timeline for Change

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<tr>
<th>Commuter</th>
<th>2020</th>
<th>2025</th>
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<th>2040</th>
<th>2045</th>
<th>2050</th>
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<td>» 9-19 seats</td>
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<th>Regional</th>
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<td>» 50-100 seats</td>
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<td>» 30-90 minute flights</td>
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<th>Short haul</th>
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<td>» ~24% of industry CO₂</td>
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<td>» ~43% of industry CO₂</td>
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<th>Long haul</th>
<th>2020</th>
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<td>» 250+ seats</td>
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<td>» 150 minute + flights</td>
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Source: ATAG
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?
Thank You