Sustainable Aviation: Progress Update

Dr Andy Jefferson to UK ACC’s June 2018
Topics to discuss

• Update on SA membership and approach
• New SA documents since 2013
• Latest performance
  – Carbon
  – Noise
  – Air Quality
• Emerging issues
• Collaborative opportunities
• Q&A
Current SA Members and Signatories

**Members**

- ADS
- Airbus
- Airlines UK
- AOA
- Birmingham Airport
- Boeing
- Bristol Airport
- British Airways
- dnata
- easyJet
- Edinburgh Airport
- Gatwick
- Glasgow Airport
- Heathrow
- Liverpool
- London City
- London Luton Airport
- MAG
- NATS
- Rolls-Royce
- TUI Group
- UTC Aerospace Systems
- Virgin Atlantic

**Signatories**

- BAE Systems
- BAR UK
- Bombardier
- Cobham
- Doncaster's
- FAC
- Flybe
- GE Aviation
- GKN
- Leeds Bradford International Airport
- Marshall Aerospace
- Meggitt
- Newcastle International Airport
- QinetiQ
- Safran Helicopter Engines
- Messier-Dowty
- Thomas Cook Airlines
- Yeovil
NEW DOCUMENTS SINCE 2013
SA Sustainable Fuel Road-Map (2014)

**BY 2030**
- £265m Gross Added Value
- Up to 12 operational plants
- £220m export value
- 4,400 jobs

**SUSTAINABLE FUEL VOLUMES**
- 4.5 million tonnes per annum
- 1.5 million tonnes per annum
- 0.7 million tonnes per annum

**EVOlUTION OF SUSTAINABLE FUEL TECHNOLOGIES**
- 2014: Biomass to liquid Alcohol to jet Green diesel
- 2020: Pyrolysis fuels Sugar to jet including SIP
- 2030: Novel hydro routes
- 2040: HEFA from algae Biotech conversion routes
- 2050:
Use of sustainable aviation fuels

Sustainable jet fuels can reduce life cycle greenhouse gas emissions by 60% compared to using current jet fuel.

- 60% reduction in carbon dioxide emissions
- Water Vapour
- Nitrogen Oxides
- Up to 90% reduction in particulate emissions
- Unburnt fuel

Source: Airlines UK - Responding to the Carbon Challenge paper (Jan 2017)
SA CO$_2$ Road-Map (2016)

3. Introduce new aircraft: UK airlines have already invested over $23 billion on 470 new aircraft since 2005 and have many more on order. These aircraft are at least 14% more fuel efficient than the aircraft they replace.
4. Design future aircraft: Aerospace manufacturers are investing heavily in the cutting edge technology that will ensure the next generation of aircraft and engines will be able to reduce CO$_2$ emissions further.
5. Start the transition to sustainable aviation fuel: Offers a 60% life cycle CO$_2$ saving compared to using fossil fuels.

2010 START
Challenge - how to accommodate expected aviation demand growth within national and global climate change objectives.

2050 FORECAST OPPORTUNITY
More than doubling UK aviation without a substantial increase in CO$_2$ emissions. Potential to halve net CO$_2$ emissions.
SA Socio-Economic Report (2016)

£60.6 billion turnover generated by UK aviation

961,000 jobs
- 341,000 direct jobs
- 350,000 indirect jobs
- 269,000 induced jobs

£52 billion contribution to UK GDP
- £22.3 billion direct contribution
  - £16.7 billion indirect contribution
  - £12.9 billion induced contribution

£1.7 billion invested in R&D
- Generates spin off benefits in terms of skills development and technology flow out to other sectors and industries

Around 3,500 apprenticeships supported by UK aviation

Over £15 million a year is invested in charity, community and good causes by UK aviation
SA Aviation & Air Quality Paper - 2017

INITIATIVES TO REDUCE EMISSIONS AT AND NEAR TO UK AIRPORTS

- **Retail deliveries are bulked up at consolidations centres, reducing the number of HGV journeys into airports.**
- **Airports are supporting ultra-low emissions vehicles, introducing electric vehicles and hydrogen fueling too.**
- **Airports are training staff to drive more efficiently, reducing emissions and improving passenger comfort.**
- **More aircraft are now taxiing to and from the runways without using all their engines, reducing emissions and noise.**
- **When able to do so, place aircraft power and heat units on the ground to continue to reduce noise and emissions.**
- **Where available, parked aircraft use electrical power and conditioned air from airport terminals to reduce emissions and noise.**
- **Community and airports alike also benefit from enhanced public transport, reducing emissions from non-airport journeys too.**
- **Airport staff are reducing emissions from commuting, through flexible working, car sharing and zero-emission options such as walking or cycling.**

We are making great progress in developing sustainable fuels that can reduce particulate emissions by 90% compared with fossil fuels.

**SUSTAINABLE AVIATION**
Cleaner. Quieter. Smarter.

Renewable energy technologies and more efficient boilers reduce emissions from operating airports.

Cleaner or zero-emission aircraft handling equipment and airport vehicles are being introduced to replace diesel versions.

Airlines are now flying a new generation of efficient aircraft, with manufacturers already developing the next.
Progress Reports (Dec 2017)

PROGRESS REPORT 2015-2017

- The Airbus A350-900 and Boeing 787-9 have reduced the area impacted by noise by at least 2.4km² than the aircraft they replace.
- 12,200 fewer people in noise contour areas at 5 SA airports than in 2014 despite 13% passenger growth.
- 2.3% increase in passengers using public transport to access UK airports in 2016 compared to 2014.
- 1% of UK NOx emissions from aircraft.
- 90,095 tonnes of CO₂ saved due to more efficient flights in UK airspace since 2014.
- Over 140 innovation and technology projects are being supported by the UK aerospace industry, worth over £700 million to cut future aircraft emissions and noise, including development of hybrid and electric aircraft.
- 1/4 of all specialist airport vehicles are zero emission electric vehicles.
- New UK special interest group to support UK sustainable jet fuels sector.
- 120,000 people employed by SA members, 2,000 more than in 2014.

28.8m more passengers in 2016 compared to 2014.

2% increase in aircraft fuel efficiency since 2014.
Progress to date - Carbon

GOAL 2 // CLIMATE CHANGE

We continue to make good progress to reduce UK aviation climate change emissions. We have disconnected the rate of passenger growth from growth in CO₂ emissions. In 2016 we published our updated CO₂ Road-Map which provided further confidence in delivering our 2012 vision of reducing net CO₂ emissions. We also successfully lobbied for the inclusion of aviation in the Renewable Transport Fuel Obligation to support the development of sustainable aviation fuels.

SA Airline CO₂ Performance

SA Airline CO₂ emissions compared to passengers and freight flown

SA Airlines included are:
British Airways (incl historic BMI data), easyJet, Monarch, Thomas Cook, Thomson Airways, Virgin Atlantic

CO₂ Emissions (Full reporters only, aircraft sources only)
RTK’s (Full reporters only)
SA Airline Fuel Consumption

SA Airline Fuel Consumption
(Litres of fuel burnt per Revenue Tonne Kilometre flown)

2% fuel efficiency improvement since 2014,
16% improvement since 2003

SA Airlines included are:
British Airways (incl historic BMI data),
easyJet, Monarch, Thomas Cook,
Thomson Airways, Virgin Atlantic

Efficiency litres/RTK
New, more fuel efficient aircraft

**AIRBUS**

- **A320neo**
  13-15% more fuel efficient than current A320 aircraft

- **A350 XWB**
  25% more fuel efficient than current aircraft it is designed to replace

**BOEING**

- **B737 MAX**
  14% more fuel efficient than current B737 aircraft

- **B787**
  20% more fuel efficient than current B767 aircraft
Purchasing new aircraft

• Over 360 new aircraft on order by UK airlines
• Represents an investment of £39.7 billion

Source: Airlines UK - Responding to the Carbon Challenge paper (Jan 2017)
Progress on Sustainable Fuels

- Informing the debate
- Resolving policy gaps
  - UK Renewable Transport Fuel Obligation
- Supporting innovation
Sustainable Aviation Fuel
Special Interest Group

The Sustainable Aviation Fuel Special Interest Group will accelerate the domestic production of sustainable jet fuel by stimulating industry and academic collaboration.

— The emerging sustainable aviation fuels market has the potential to reduce emissions, create jobs, and bolster investment in science and technology.
— By 2030, sustainable aviation fuels will contribute £265m per annum to the UK economy and create 4,400 jobs.
— By 2050 sustainable aviation fuels will offer 15 - 24% reduction in CO₂ emissions based on a 25-40% market penetration.
— The Sustainable Aviation Fuel Special Interest Group will help deliver these benefits by building the supply chain and stimulating innovation.

Innovate UK
Knowledge Transfer Network
SUSTAINABLE AVIATION
Department for Transport

www.SAFSIG.co.uk | @KTNUK | enquiries@ktn-uk.org
Progress to date: Noise

GOAL 3 // NOISE

Limit and, where possible, reduce the impact of aircraft noise.

We have made good progress against our commitments in our 2013 Road-Map, however these improvements have not always been reflected in community perceptions. During 2017, to further understand concerns of communities we commissioned independent research and will publish a discussion paper in 2018 on the findings to identify the most effective solutions to manage the impact of aircraft noise.
Noise performance

**Noise Contour Area vs Population for SA Airports (LGW, LHR, LTN, MAN, STN)**

- **13% growth in passengers handled since 2005**
- **12.8% reduction in contour area since 2005**
- **but only a 0.1% decrease in population within the contour area**

- Area 57 Leq (km²)
- Pop within 57 Leq contour (000’s)
- Passengers handled
GOAL 3 // NOISE

To limit and where possible reduce the impact of aircraft noise

Airport growth compared to noise contour area and population exposure (LGW, LHR, LTN, MAN and STN Airports)

55% increase in terminal passengers since 1998
40% reduction in contour areas since 1998
27% reduction in population exposure since 1998
Reducing noise at source

Long term targets are to reduce perceived noise from new aircraft by 65% in 2050 compared to 2000.

The UK ATI has funded 44 projects with a grant value of £237 million for research in these areas to the end of 2016.

This includes investigations of new engine cycles and key components, noise generation of propellers and undercarriages.

On average it costs the aerospace industry £1 billion to reduce aircraft noise by one decibel.
Operational improvements

- Over 63,000 extra CDAs in the last 2 years
- Airport performance based navigation trials
- Steeper and Low noise arrivals trials
- Departure climb out trials
- Respite trials

Stansted Airport Example

**Conventional Departure Procedures**

**RNP1(RF) Departure Procedures**

Area overflown reduces by 2/3rds
SA Independent Community Forums 2017

- 3 focus groups were independently facilitated at Gatwick, Birmingham and Manchester in July 2017
- They were asked about what sort of noise causes annoyance, how this varies depending on their circumstances and their suggestions for how things could be improved

Noise factors causing most annoyance to participants in the study

- Volume
- (In)frequency
- Time of year and day
- Pitch and tone
The feedback from the discussions highlighted that:

- the experience of aviation noise is less affected by people’s postcode and whether they live on a flight path or not, but more by individual noise tolerance levels and views on the advantages of having an airport on their doorstep
- it is often a change in personal circumstances that causes aviation noise to be experienced as more or less disruptive
- Participants who were newly overflown all reported that they experienced aviation noise as very disruptive
- Current noise metrics merit improvement
- Improved relationship between industry and communities in exploring solutions to noise concerns would be helpful
- There may be new opportunities and ways to consider noise compensation
Air quality is a growing concern for communities and policy makers. In response, SA published a report on UK aviation and air quality. It concluded that aircraft emissions contribute 1% of the UK nitrogen oxide (NOₓ) emissions and 0.1% of UK particulate (PM₁₀) emissions with a range of opportunities being explored to reduce this further.
Air Quality activity

• Engaged ground handlers in work
• Opened discussions with HM Treasury re incentives to support specialist low emission vehicles
• Exploring best ways to reduce emissions during aircraft turnarounds
• Continued to act as forum to share best practice and knowledge on new technologies
• Airports continue to deliver surface access strategies
EMERGING ISSUES
Emerging Issues for UK Aviation

- **Carbon**
  - Future technology challenge
  - Scaling up sustainable fuel production
  - Modernising airspace
  - Aviation’s role in UK and global CO2 targets

- **Noise**
  - Future technology challenge
  - Modernising airspace
  - Land use / housing needs
  - Evolving community expectations on noise
  - Uncertain policy climate

- **Air Quality**
  - Move to low emission vehicles
  - Improving surface access

- **Communications**
  - Balancing progress with stakeholder perceptions / expectations
Emerging aircraft technology concepts

- Electrification
- Urban air mobility
- New propulsion systems
Global Airline CO$_2$ Targets

**2010**
1.5% p/a fuel efficiency
Working towards Carbon Neutral Growth (CNG)

**2020**
CNG from 2020
Emissions stop growing and start to reduce
Delivered through CORSIA

**2050**
Emissions reduce by 50% by 2050
Delivery mechanism to be finalised

CORSIA = Carbon Offsetting and Reduction Scheme for International Aviation
How does CORSIA work?

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<th>PILOT PHASE</th>
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<th>SECOND PHASE</th>
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<td><strong>VOLUNTARY</strong></td>
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<td>66 States have volunteered to be part of the scheme from 2021 (more States are encouraged to volunteer).</td>
<td>Exemptions for: Small Islands, Least Developed Countries, Land-locked Developing Countries and States which have less than 0.5% of air traffic (although they can still volunteer).</td>
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<td>Operators in the States included will offset emissions based on the average CO₂ growth of the aviation sector.</td>
<td>Operators will offset based on average CO₂ growth of the sector.</td>
<td>Offset obligations shift to include over 20% of individual operator growth.</td>
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<td>Offset obligations shift to be over 70% based on individual operator growth.</td>
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2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035

Over 80% of the growth in air traffic CO₂ after 2020 will be offset.

See: https://www.icao.int/environmental-protection/Pages/market-based-measures.aspx
Suggested collaborative opportunities

• Opportunities
  – Smarter land use planning policies around airports
  – Airspace modernisation - realising the potential of current and future navigation / flight management system technology
  – Smarter mechanisms to evaluate decisions on aircraft noise
    • Sharing and understanding performance and investment by industry
    • Developing better cost / benefit analysis models that suit local circumstances
  – Supporting surface access improvements to UK airports
  – Seeking to maximise joint effort on issues such as promoting low emission vehicles
  – Maintaining an open dialogue with the industry
  – Maintaining pressure on HMG to provide policy certainty for UK aviation activity
QUESTIONS?
Contact

For more information visit

www.sustainableaviation.co.uk

Or email

info@sustainableaviation.co.uk

Neil Robinson, Chairman, Sustainable Aviation
Dr Andy Jefferson, Programme Director, Sustainable Aviation
Quieter: SA Noise Road-Maps (2013)

Further benefits will come from other elements of the Noise Roadmap.