



### INTERNATIONAL AVIATION POLICY SERIES

## Environmentally Sustainable Growth





### **Overview of BARA**



The Board of Airline Representatives of Australia (BARA) is the industry body promoting the safe and efficient operations of international airlines serving Australia for the benefit of consumers, businesses and tourism.

BARA is a member-driven industry body that delivers value through setting key expectations and desired outcomes for Australia's aviation infrastructure and service providers. BARA's members include many of the world's largest airlines, providing 90% of all international passenger flights, and carrying most exports and imports of freight to and from Australia.

#### BARA's Vision and Outcomes

To guide BARA's work and clearly articulate its ideals, BARA's members have developed a document setting out the vision and outcomes for international aviation in Australia, available at <a href="http://www.bara.org.au">www.bara.org.au</a>.

BARA's vision for Australia's international aviation industry is 'high quality, adaptive and efficient'. Underpinning this vision are four key outcomes that BARA has identified to boost the competitiveness, productivity and financial performance of industry participants:

Outcome 1: Timely and reasonably priced airport infrastructure

- Outcome 2: A competitive supply of jet fuel
- Outcome 3: Safe and efficient air navigation services
- Outcome 4: Environmentally sustainable growth

BARA has published policy papers on the first three outcomes, available at BARA's website.

#### Environmentally sustainable growth

This paper identifies initiatives for how airlines, air navigation service providers and governments can capitalise on emerging aircraft and air navigation technologies to improve the operational performance of aircraft, benefitting the environment and the community.

Australia's regulatory frameworks for mitigating the impacts of aircraft noise require modernisation to allow international airlines to improve their operational and environmental performance. This will encourage ongoing industry growth and support Australia's tourism industry and travel opportunities for Australians, while also meeting the community's environmental expectations.

### **BARA'S Members**

AIRCALIN AIR CANADA **AIR INDIA AIR MAURITIUS** AIR NEW 7EALAND **AIR VANUATU** ALL NIPPON AIRWAYS AMERICAN AIRLINES **ASIANA AIRLINES** CATHAY PACIFIC AIRWAYS CHINA FASTERN AIRLINES CHINA SOUTHERN AIRLINES DELTA AIR LINES **EMIRATES** ETIHAD AIRWAYS EVA AIR **FIJI AIRWAYS** GARUDA INDONESIA **JAPAN AIRLINES** LATAM AIRLINES GROUP MALAYSIA AIRLINES PHILIPPINE AIRLINES **QANTAS AIRWAYS QATAR AIRWAYS ROYAL BRUNEI AIRLINES** SINGAPORE AIRLINES SOUTH AFRICAN AIRWAYS THAI AIRWAYS **TURKISH AIRLINES** UNITED AIRLINES **VIETNAM AIRLINES VIRGIN AUSTRALIA** 

### **Executive Summary**

Australia's international aviation industry is experiencing sustained growth. Passenger numbers have increased on average by more than 5% each year over the last ten years. There are now over 500 international flights each day to and from Australia, serving over 38 million international passengers annually.

International airlines acknowledge that providing today's range and frequency of services affects the environment and community. Their goal, therefore, is to find ways of minimising the industry's environmental impacts, namely aircraft emissions and noise.

The three paths to improved environmental performance are identified as:

- evolving aircraft technologies and air navigation services
- emissions reduction schemes
- best practice aircraft operations

Member airlines are investing billions of dollars in 'new generation' aircraft, which they use to serve routes to and from Australia. These aircraft are 10–30% more fuel efficient and make 15% less noise than the aircraft they are replacing (and are 80% more fuel efficient than 1960s jet aircraft).

Australia's international flights are one part of a global network. To address aggregate carbon emissions, the International Civil Aviation Organization (ICAO) is establishing a Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This industry-led initiative aims to achieve carbon neutral growth for international flights from 2020. Australia has committed to participating in CORSIA from its planned commencement in 2021.

There are opportunities to deliver better aircraft noise outcomes for communities by enabling modern aircraft to operate as quietly as possible. Around our busy international airports, a modernised approach to aircraft operations on approach, landing and departure could reduce the noise impact on surrounding communities. While achievable reductions will depend on airport-specific factors and daily weather conditions, noise reductions for individual flights in the order of 10% to 50% are possible.

As Australia's busiest and most operationally-restricted airport, BARA supports a review of the existing noise mitigation framework for Sydney Airport. Desirably, such a review would lead to the development and implementation of more effective measures of aircraft noise impacts and respite than the current hourly movement cap. The new runways planned at the other major international airports also provide an opportunity to review and modernise each airport's noise mitigation framework.

International airlines are interested in working with all stakeholders to identify and implement ways to improve the industry's environmental performance.

Recognising and measuring the industry's environmental impacts, and how such impacts interact with community expectations, is a key element of developing cost-effective mitigation strategies.

The two main environmental impacts of aircraft operations are emissions and noise. Noise is particularly relevant for people who are directly affected due to their proximity to aircraft flight paths and airports.

#### Aircraft emissions

Aircraft engines produce emissions resulting from fossil fuel combustion, namely carbon dioxide (CO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), water vapour (H<sub>2</sub>O) and particulates. These engines emit a sizeable proportion of such emissions at high altitude (8–12km) as aircraft travel across the oceans and continents.

ICAO states that international flights account for about 1.3% of total  $CO_2$  emissions globally, with the impact of aircraft emissions adjusted upwards to reflect the proportion emitted at high altitude.

Although scientific understanding is increasing, many uncertainties remain as to how aviation operations may affect the climate aside from  $CO_2$  emissions. In areas of high traffic density, water vapour emissions in combination with emitted or background aerosols can generate contrails and increase cloudiness. This additional cloudiness can influence the temperatures of affected areas.

At a local level, aircraft and aircraft-related activities at and around airports can also be a source of emissions, affecting local air quality at ground level. About 10% of the aviation industry's emissions are produced by activities at airports, as well as by the transport of passengers and freight to and from airports. The potential health impacts of ultra fine particles (UFPs) is also an issue of community concern. However, as ICAO's 2016 Environment Report<sup>1</sup> notes, reducing  $CO_2$  emissions would also reduce the emission of ultra fine particles.

A comprehensive description and discussion of aircraft emissions and their potential impacts on the global climate and local air quality is available in ICAO's 2016 Environment Report.



<sup>1</sup> ICAO 2016, On Board a Sustainable Future 2016 Environmental Report, pp. 94.



#### Aircraft noise

An aircraft in flight compresses the air around it, which causes noise in addition to that made by its engines. The noise generated by each plane is influenced by many factors, including the aircraft's acoustic design, the underlying noise quality of engines, and the level of engine thrust applied.

Aircraft noise increases when the plane's landing gear and flaps have been deployed. Aircraft departing with the deployment of full engine thrust make more noise than aircraft approaching for a landing with engines on idle or low thrust.

People living near airports or under or near busy flight paths are exposed to aircraft noise, which can affect people differently. Many people are not aware of aircraft noise until they are exposed to it overhead. As noise perception is subjective, broad surveys are used to gauge the number of people affected by aircraft operations and the level of exposure at different times during the day and night.

BARA's members understand aircraft noise is an issue of significance to communities and that the industry needs to actively participate in developing and implementing aircraft noise mitigation strategies.

#### Measuring aircraft noise

Given aircraft noise varies across the flight, the following three reference points are measured for individual aircraft.

- Approach: 2km from the runway threshold, under the flight path
- **Sideline:** the highest noise measurement recorded at any point 450m from the runway centreline during take-off



• Fly-over: 6.5km from the brake release point, under the take-off flight path

Source: ICAO

The Australian Noise Exposure Forecast (ANEF) system is used as the main measure of describing aircraft noise in and around Australian airports. The ANEF incorporates the expected number of flights, types of aircraft, flight paths and the distribution of traffic. As an aggregate measure, ANEF includes assumptions about how the level and frequency of aircraft noise influence total noise exposure. The combination of the industry recognising it must reduce its environmental impacts and the constant drive to improve efficiency provides an imperative for continual advancements in aircraft technologies and air navigation services. The best environmental outcomes are achieved when air navigation services enable modern aircraft to operate as efficiently and quietly as possible.

#### Aircraft

The aviation industry is producing increasingly efficient aircraft. Advances in aircraft technologies generally involve:

- weight reduction, using advanced alloys and composite materials, such as carbon fibre reinforced polymer hulls and lightweight body paint
- aeroplane aerodynamics, such as wingtip devices
- engine-specific performance, producing a greater level of thrust for less fuel and at quieter noise levels

Current and emerging aircraft are expected to have fuel efficiencies of about three litres of fuel burned for each 100km travelled per passenger – a reduction of 60% in just 20 years. ICAO has also set a  $CO_2$  standard for new aircraft starting in 2028, to ensure improvements in aircraft emissions are maintained and improved over time.

New aircraft also have a noise footprint on average 15% smaller than the aircraft they are replacing. Aircraft equipped with engines meeting the latest noise standards are quieter by seven Effective Perceived Noise decibels (7 EPNdB).

#### Reductions in noise levels per aircraft

Improvements in aircraft design are producing discernible reductions in the noise output of aircraft over time. Indeed, ongoing improvements in aircraft technologies are a major contributor to the better environmental performance of the international aviation industry.



#### Air navigation services

Enabling new generation aircraft to operate to their highest level of performance will maximise potential reductions in emissions and noise. Depending on the airport, an international flight using an optimal path can be expected to achieve a 10% fuel burn efficiency and emit a reduced level of aircraft noise.

Modern aircraft require performance-based air navigation services to operate as efficiently and quietly as possible. Air navigation services continue to evolve from a system based on fixed rules and operating procedures to one with an operational performance that emphasises safety and efficiency. This is being accomplished by a fundamental shift towards advanced air traffic management automation and satellite technologies for communication, navigation and surveillance.

Flight times are reduced when aircraft follow flight paths that best suit the wind conditions on the day of operation. As an example, using flight paths based on actual wind (or air miles), rather than the ground distance (or ground miles), has reduced flight times between Sydney and Dubai by about 12 minutes. This reduces the fuel burn of an Airbus 380 by some 2,000 litres, or over 30 average family car fuel tanks.

Aircraft delays can be minimised through sharing up-to-date and accurate information that allows improved real-time decision making. Known as 'airport collaborative decision making' (A-CDM), this system uses joint procedures to generate efficiencies in the aircraft turnaround process.

BARA's policy document, <u>Safe and Efficient Air Navigation Services</u>, describes our vision for the progressive modernisation of air navigation services in Australia.



#### The future of integrated aircraft and airport operations

#### Required navigation performance

Required navigation performance (RNP) is a satellite-based technology that provides high levels of three-dimensional positional accuracy for aircraft operation. RNP allows those aircraft equipped with the technology to follow optimal flight profiles. It also offers the opportunity to avoid areas that are sensitive to aircraft noise where possible, and equitably share aircraft noise when flights over residential areas are necessary.

The international aviation industry is proactively addressing emissions produced by its aircraft in flight. As well as ongoing improvements in aircraft engine efficiency and the emergence of sustainable alternative jet fuels (SAJF), ICAO is facilitating the implementation of CORSIA, in order to enable the industry to achieve carbon neutral growth from 2020.

In 2010, ICAO set the industry the goals of an average improvement in fuel/CO<sub>2</sub> efficiency of 2% a year, and carbon neutral growth from 2020. The International Air Transport Association (IATA) has set an aspirational goal of a 50% reduction in CO<sub>2</sub> emissions on 2005 levels by 2050. These goals have been driven by the industry recognising its need to meet community expectations.

#### CORSIA

Under CORSIA, international airlines will compensate for their carbon emissions above 2020 levels by buying credits from approved carbon reduction projects from around the world. Under its phased implementation, participation is voluntary from the period of its planned commencement in 2021 until 2026. Australia is one of 70 countries to participate voluntarily. From 2027, CORSIA will be mandatory for most countries. More detail on CORSIA can be found at www.icao.int.

ICAO estimates the cost of the carbon offsets will range from 0.2% to 0.6% of the international aviation industry's total revenues in 2025; and 0.5% to 1.4% by 2035.

#### Sustainable alternative jet fuels

For aviation, there are no practical options forseen in the next few decades to power most aircraft other than with liquid fuels. To reduce emissions, one emerging technology is SAJF, where the fuel is derived from organic material (biomass), such as plants.

Since 2013, when the first regular flight using SAJF took place between New York and Amsterdam, 21 airlines have now used SAJF for their commercial flights. Recently, Australianbased carriers committed to buying initial volumes of SAJF for some of their international flights to and from Australia.

Current SAJF use is modest due to its cost relative to jet fuel. To support its potential use in Australia, it will be important that the existing networks of Australian jet fuel infrastructure supply chains have the capability to deliver SAJF. This should occur as part of the overall reform of Australia's jet fuel infrastructure supply chains, as detailed by BARA's policy document, <u>A Competitive Supply of Jet Fuel at</u> <u>Australia's Major International Airports</u>.



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# **Proactive Noise Mitigation**

Responding to community aircraft noise concerns remains a challenging task, but one to which Australia's international aviation industry is committed.

To improve its environmental performance, the industry needs to operate within a framework that best supports continuous improvement in aircraft operations within Australian airspace. Wide stakeholder support will be necessary in developing and applying modernised aircraft noise mitigation frameworks.

#### The 'balanced approach'

The overarching framework for addressing aircraft noise is ICAO's 'balanced approach', which is based on the following four pillars:

- 1. reduction of noise at source
- 2. land use planning and management
- 3. noise abatement operational procedures
- 4. operating restrictions on aircraft

The balanced approach seeks to ensure policy developments are coordinated and aligned in order to deliver improved noise outcomes for the community.

#### Australia's approach

In Australia, all tiers of government have some level of involvement in aircraft noise mitigation. State, territory and local governments are mainly responsible for regulating land use and development around airports, for example, approving new housing developments. The Australian Government is responsible for regulating how aircraft operate to and from Australia's international airports.

The most prescriptive and extensive requirements exist for Sydney Airport, and cover almost all aspects of airline operations. Night-time curfews, hourly movement caps, noise-sharing modes and flight path restrictions are all used to mitigate aircraft noise at Sydney Airport. A curfew is also in place at Adelaide and Gold Coast airports.

Australia's existing aircraft noise mitigation measures rely on fixed rules, including in some cases the prescription of the aircraft types which may undertake particular operations, preventing quieter and more fuel-efficient modern aircraft from being operated. The current regulations applicable to freighter aircraft that can operate into Sydney Airport during the curfew period are an example of this.

On a more progressive note, BARA supports the National Airports Safeguarding Framework, which provides advice for land-use planners and decision makers in assessing proposed developments within and around an airport's prescribed airspace.

BARA sees merit in moving from fixed rules and regulations to a framework that better encourages improved environmental performance based on the noise output of individual aircraft. This 'outcomes' focus will provide scope for the alignment of the regulatory framework and ongoing advancements in aircraft technologies and air navigation services.

# **Efficient Aircraft Operations**

Allowing modern aircraft to fly optimal flight paths has the potential to significantly improve aircraft noise outcomes for Australian communities. Future aircraft operations should progressively deliver tangible reductions in noise for communities<sup>2</sup>, as described below.

#### Ideal arrivals and departures

- Variable geometry (glide slope) runway approaches aircraft always approach the airport on idle thrust, minimising engine noise. This can reduce the noise output of the engine by 3 – 12 decibels during windy conditions, which translates into a 'perceived noise' reduction to people on the ground of 19% to 57%.
- Continuous descent and noise abatement departure procedures aircraft fly the best possible, or 'smoothed,' profiles to minimise changes in engine thrust. This can reduce perceived noise by 8% to 42% compared with conventional practices.

#### Arrivals to include variable approach to reduce noise



#### Flight paths to mitigate and equitably share aircraft noise

- Multiple approach paths, allowing accurate noise sharing on individual flight paths.
- Precision flying, with flight paths designed to minimise the impact on noise-sensitive residential areas where practically possible.

#### Precision approaches and multiple flight paths can reduce and equitably share noise



Improved noise outcomes for Australian communities can be achieved by modernising the way aircraft noise is managed. It requires progressively moving away from fixed regulations and measures towards specifying the outcomes that the industry needs to reach.

The international aviation industry has a strong interest in actively participating in the development and implementation of improved noise mitigation strategies. Making the best use of new generation aircraft to the benefit of communities is necessary to help justify the investments made in these enhanced aircraft capabilities.

#### Overarching environmental improvement strategies

As Australia's busiest and most heavily regulated airport, BARA supports the *Joint Study on Aviation Capacity in the Sydney Region's* proposal to review the current operational restrictions at Sydney Airport. There are opportunities to develop and implement more effective measures of aircraft noise impacts and respite than the existing runway end movement numbers. Allowing industry to efficiently manage its daily operations within overall noise objectives will deliver better outcomes overall for communities and passengers.

There are various options that could be explored as part of an overall environmental impact reform package. These include:

- noise metrics for individual aircraft
- operation flexibility to reduce noise and fuel burn
- noise budgets for each airport
- publicly available reporting on improvements achieved

Planning for new runways at Australia's other major international airports also provides an opportunity to review and modernise the relevant noise mitigation strategies. Changes to aircraft, airport operations and airport infrastructure will be necessary to support growing traffic volumes, including building new runways at some airports in the future. Flight paths and airspace architecture should be reviewed to promote increasingly efficient safe aircraft operations. Enabling the efficient operation of aircraft with enhanced capabilities will deliver better noise outcomes for the community.

BARA will continue to work with all industry participants, including government at all levels, in supporting the development and implementation of frameworks to minimise the industry's environmental impact and meet community expectations.



# The leading voice of airlines



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