ICANA2023

Active Noise Abatement at the source

Stefan Moal
Acoustic Expert & Technical Advisor
Airbus Engineering

AIRBUS

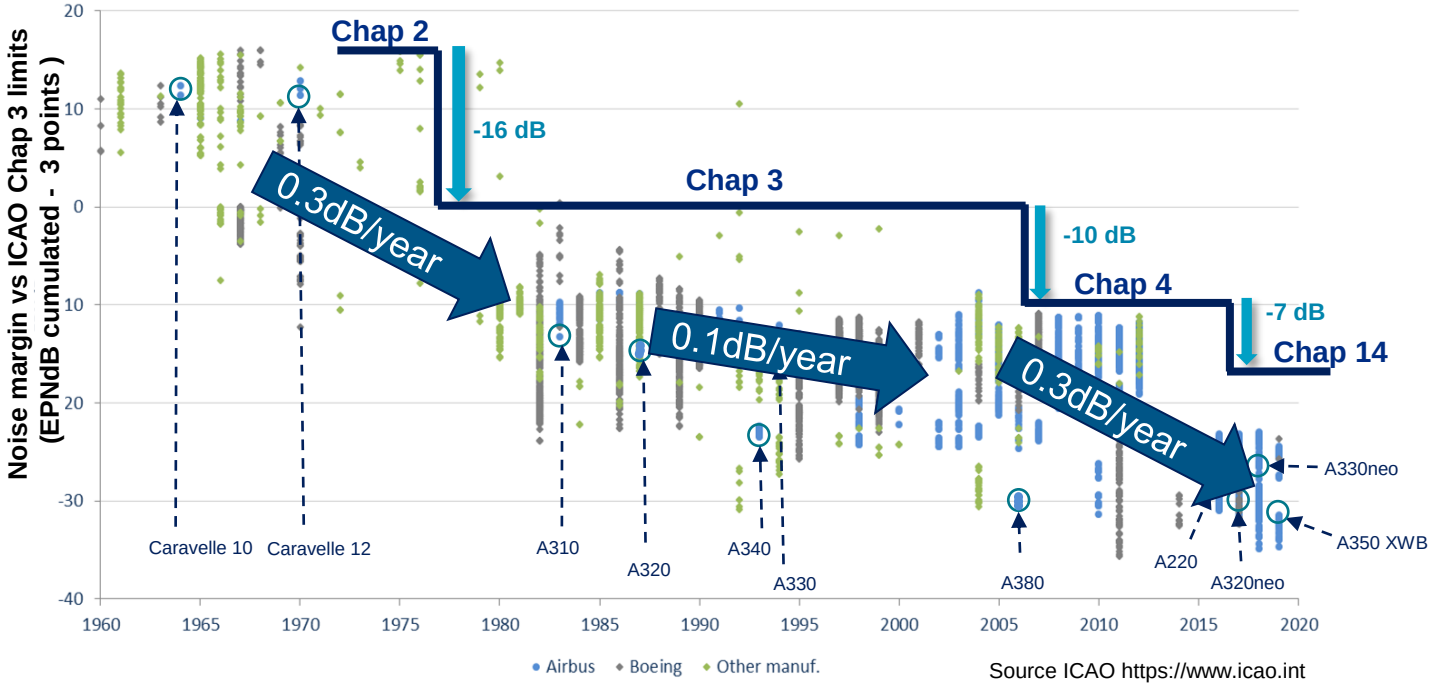
Agenda

- Long-term trends on noise & success stories: A320neo family, A350
- Situation around European airports
- Balanced approach & Airbus involvement in local initiatives
- Corporate Sustainability Strategy
- Technology roadmap for R&T

Agenda

- Long-term trends on noise & success stories: A320neo family, A350
- Situation around European airports
- Balanced approach & Airbus involvement in local initiatives
- Corporate Sustainability Strategy
- Technology roadmap for R&T

Historical noise reduction



Source ICAO https://www.icao.int

75% Noise reduction(*) compared to early ages of aviation

All Airbus commercial aircraft have today a significant margin to current Chapter 14

(*) 75% in take-off, 70% on average take-off + landing

AIRBUS

Sharklets
Improved aerodynamic performance induces noise reductions

New engines
Bypass ratio increased from 9 to 12
Up to 81 inch fan diameter
Latest nacelle liners technology

Air Flow deflectors
Cavity noise suppression is now baseline on Neo (retrofittable on Ceo)

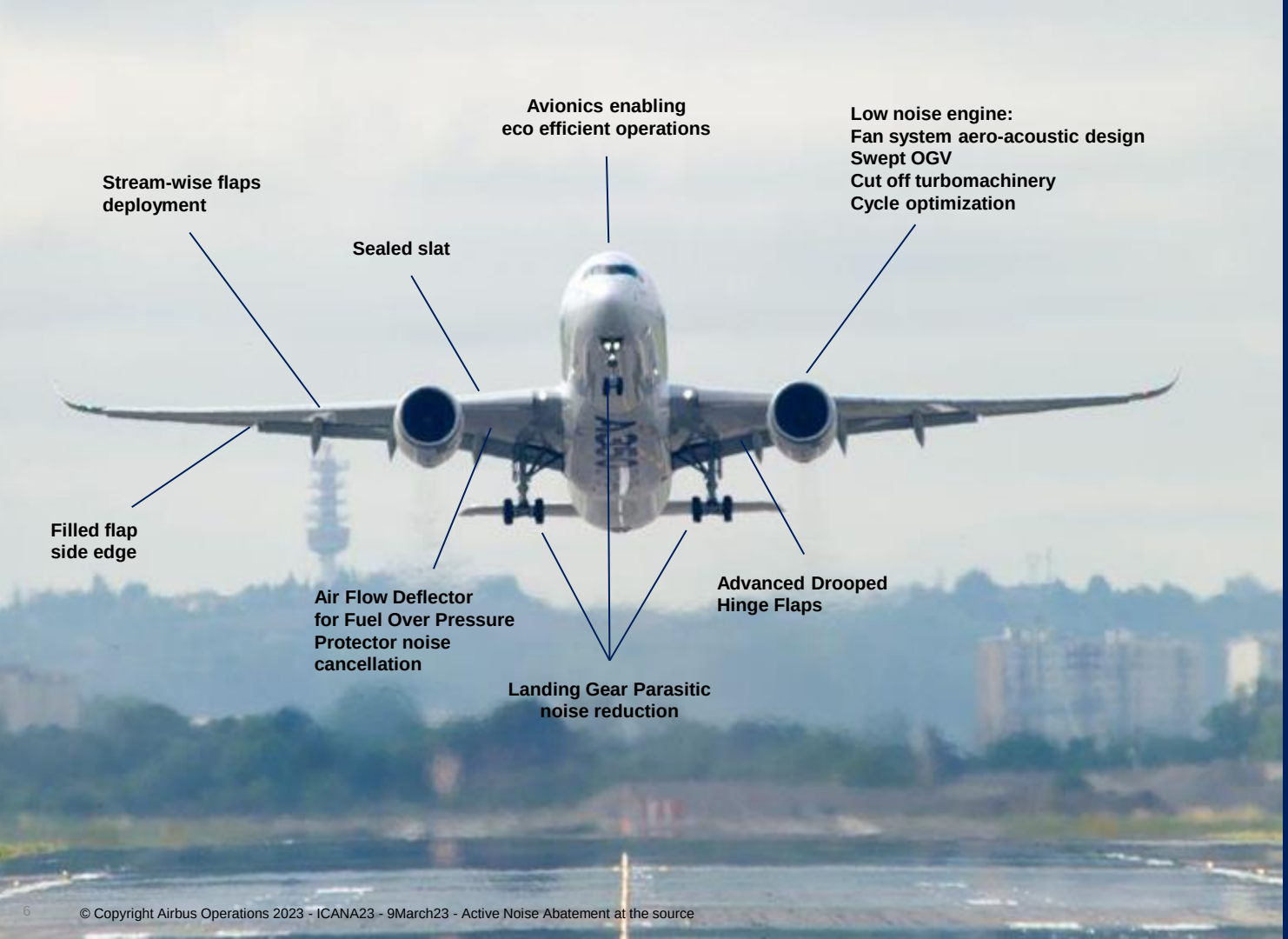
A320neo family

The New Engine Options for the A320neo offer high bypass ratio engines with latest propulsion system acoustic design and technologies.

12dB

below ICAO Ch14 limit - 10dB cumulated vs SAceo

AIRBUS



A350

RR Trent XWB

State of the art aerodynamics & engine technologies for noise reduction

14dB

below ICAO Ch14 limit
-16dB cumulated vs A340-300

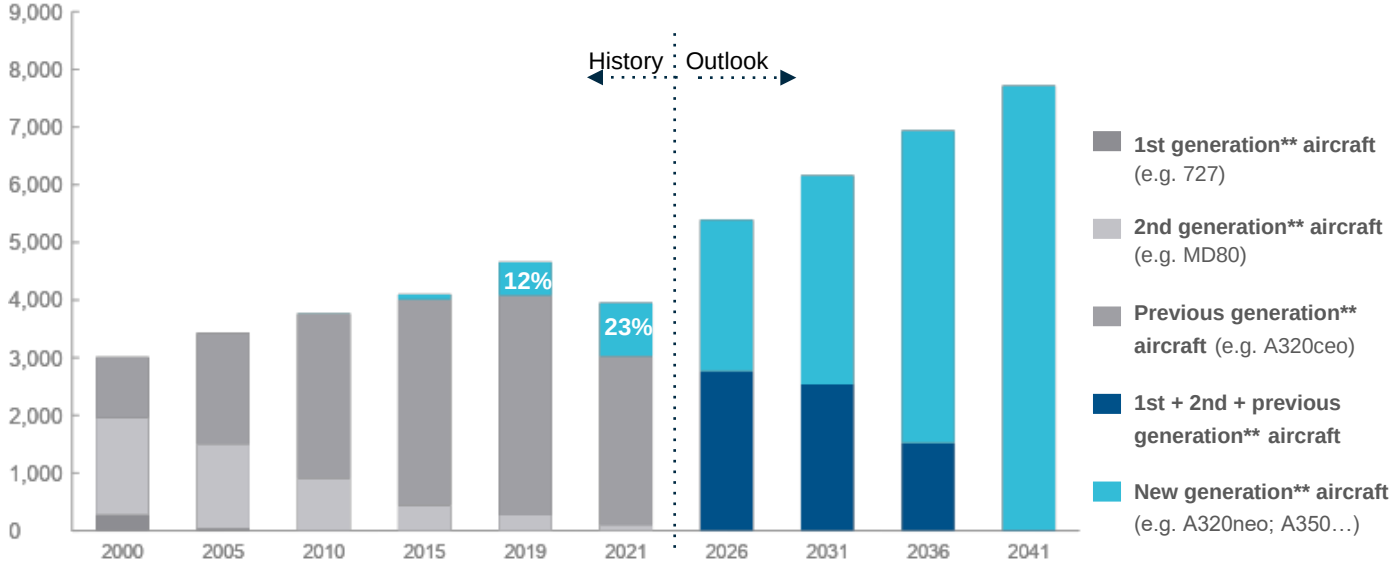
AIRBUS

Agenda

- Long-term trends on noise & success stories: A320neo family, A350
- Situation around European airports
- Balanced approach & Airbus involvement in local initiatives
- Corporate Sustainability Strategy
- Technology roadmap for R&T

Noise exposure and fleet renewal

Number of passenger aircraft in service*



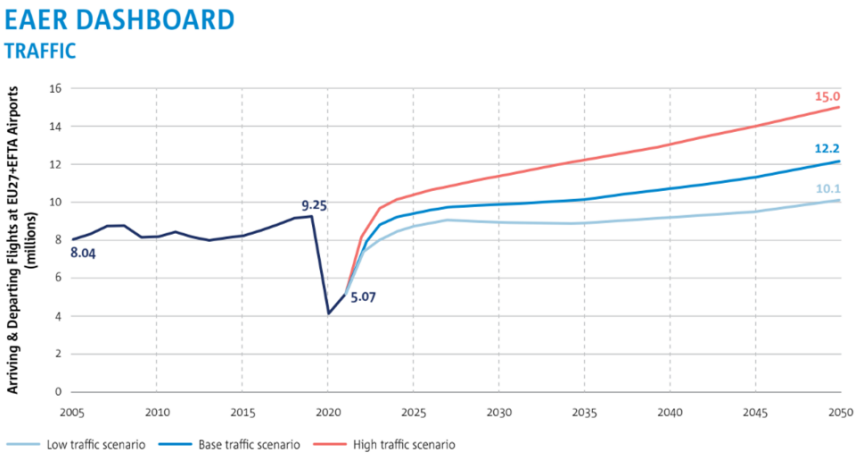
Source: Cirium, Airbus
* Western built passenger aircraft above 100 seats – pax aircraft only / **1st generation: A300, DC 9, DC10, 707, 727, 737, 747 / 2nd generation: A310, MD11, MD80, MD90,737, 747, 757, 767, F100
Previous generation: A320 Fam., A330, A340, 717,737NG, 747, 777 / New generation: A220, A320neo Fam., A330neo, A350, A380, 737Max, 777X, 787 & new programs

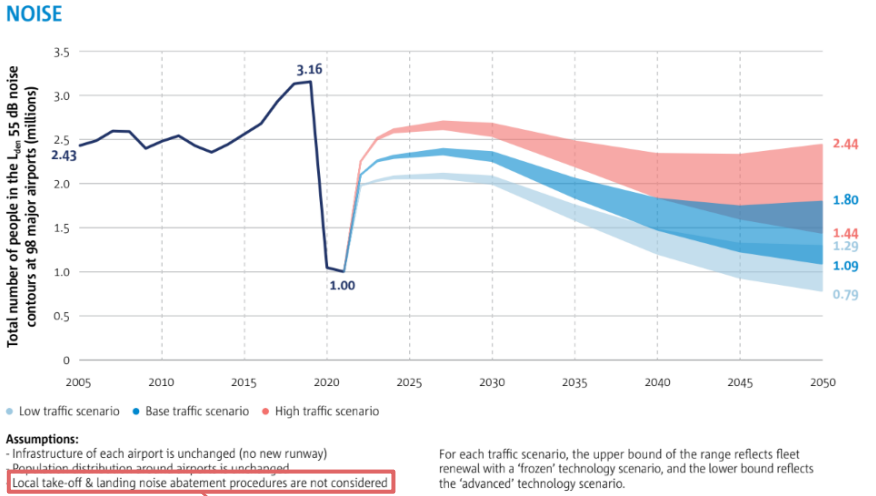
EASA, 2016:

Among various drivers, "**Fleet renewal has led to a 12% reduction** in the average noise energy per operation between 2005 and 2014"

"Noise exposure has stabilised over the past ten years"

EASA: “Fleet renewal could lead to reductions in total noise exposure at European airports as measured by the Lden and Lnight indicators over the next twenty years”

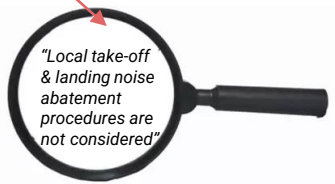




Source: European Aviation Environmental report, EASA 2022

*“... **indicators may start to increase again in the longer term** if manufacturers do not **develop new quieter types of aircraft** to offset the growth in traffic”*

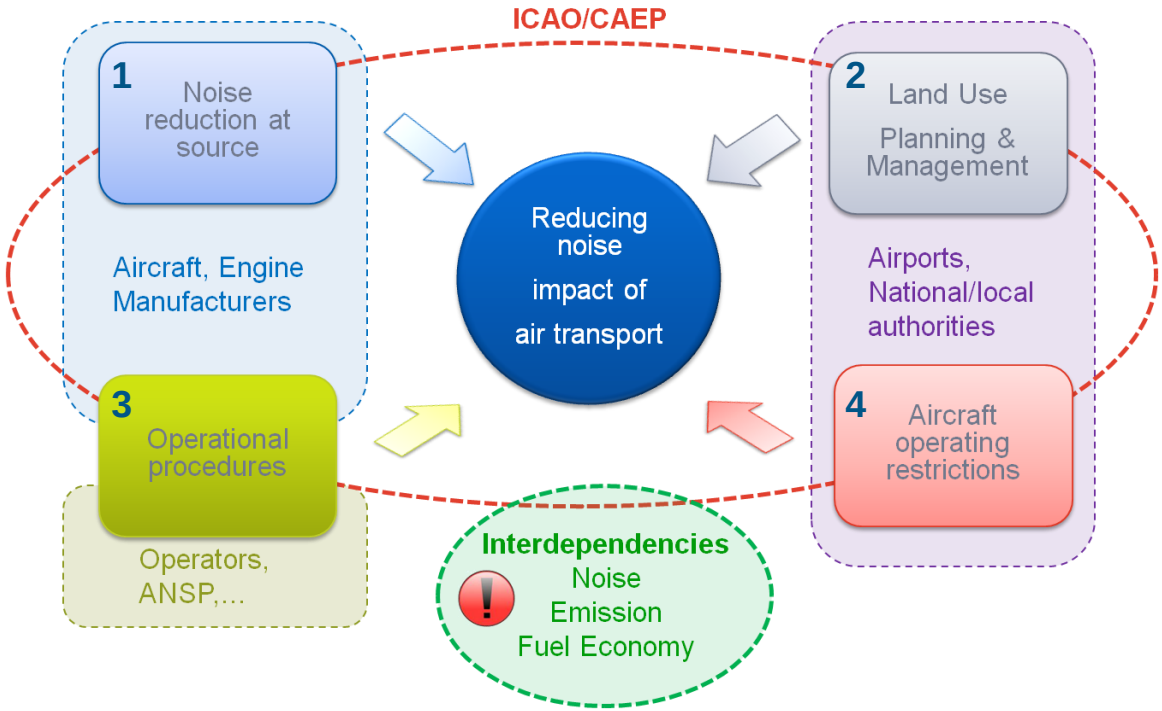
Additional levers



Agenda

- Long-term trends on noise & success stories: A320neo family, A350
- Situation around European airports
- Balanced approach & Airbus involvement in local initiatives
- Corporate Sustainability Strategy
- Technology roadmap for R&T

Balanced approach for aircraft noise management



*"ICAO Contracting States acknowledged that it was important to **consider equally all of these elements**, and they agreed to the principle that operating **restrictions should not be applied as a first resort**"*

Source: ICAO Doc9829

ICAO: International Civil Aviation Organisation
CAEP: Committee on Aviation Environmental Protection
ANSP: Air Navigation Service Provider

AIRBUS

Airbus towards Airports and Communities

- Promotion and customization of low-noise procedures
- Noise expertise in airport community working groups
- Aircraft noise awareness, listening booth
- Understanding annoyance/psychoacoustics

Agenda

- Long-term trends on noise & success stories: A320neo family, A350
- Situation around European airports
- Balanced approach & Airbus involvement in local initiatives
- Corporate Sustainability Strategy
- Technology roadmap for R&T

Corporate Sustainability Strategy

Pioneering sustainable aerospace

Offer 100% SAF capability on our commercial aircraft before

2030

Offer a hydrogen-powered aircraft by

2035

Supporting aviation industry's "net-zero carbon emissions target" by

2050

Noise management

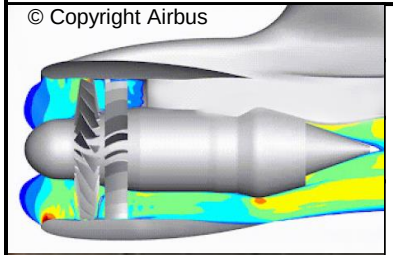
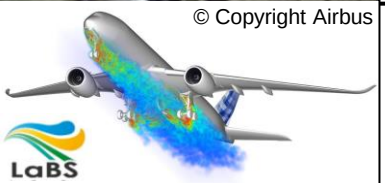
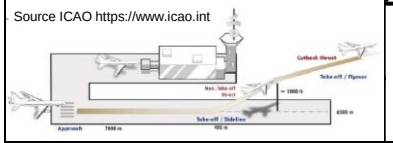
Decarbonization technologies
(hydrogen, electrification, alternative fuels, ultra-efficient aircraft) are not automatically game changers for noise

More **integrated propulsive system**
through collaboration and co-simulation with Engine Manufacturers

Acceleration in noise R&T to meet social expectations
for all possible aircraft configurations

Future aircraft architecture and integration

H2020 ANIMA: European R&T roadmap

Topic	Subtopic
 Aero-acoustic integration of Ultra High Bypass Ratio turbofan	Advanced nacelle acoustic technologies
	Flow physics simulation applied to fan & turbomachinery
	Integrated low-emission combustors
	Jet / Airframe interaction mitigation
 Acoustic integration of high-efficiency/low-emission unconventional propulsion systems	Ducted Fan including Variable Pitch
	Propellers, Open Rotors & Unducted Fans
	Aero-acoustics of Boundary Layer Ingestion Propulsion
	Distributed propellers
	Electrification/hybridization
 Low-noise airframe design	Low-noise Landing Gear Design and Installation
	Low-noise wing and movables integration
	Aeroacoustic scaled demonstration
 Operational Noise	Enhanced Arrival/Departure Procedures
	Ground operations

Road to sustainability is crowded

AIRBUS

Ultra-high bypass ratio engine - SAAFIR

Massive engine rig for understanding and validating prediction methods, through comprehensive testing in large wind-tunnels.

Hydrogen-powered engine

One of the potential solutions to equip Airbus Hydrogen-powered aircraft that will enter service by 2035.

AIRBUS

A380 Propulsion Demonstrator

Open Fan Technology

Accelerate advanced propulsion technologies through ground & flight testing

Evaluate propulsive system efficiency and performance

- Assess aircraft engine integration and aerodynamics
- Evaluate internal & external noise prediction models
- Understand the use of hybrid-electric capabilities
- Ensure compatibility with 100% Sustainable Aviation Fuel

AIRBUS

Erfolgreiche Flugzeug Lärmreduzierung über die letzten Jahrzehnte. Akustisches Design ist weiterhin ein starker Driver in unserer Industrie. Zusammen mit unseren Partnern investieren wir in lärmreduzierende Technologien und Entwicklungskapazitäten.

Flugverkehr muss den Umwelt- und Gesellschaftlichen Anforderungen gerecht werden. Wir arbeiten an ambitiösen Lösungen um eine nachhaltige Wirtschafts und Transport Entwicklung weiter zu unterstützen.

Vielen Dank für Ihre Aufmerksamkeit

Aircraft noise performance has made significant progress over the last decades and design for noise continues to be a strong driver in our industry. Together with our Partners, Airbus strongly invests in necessary Technologies and Capabilities and we feel well supported in those efforts.

Air traffic is facing multiple environmental and societal challenges. We are seeking for the most ambitious and balanced approach to support a sustainable development of transportation and economy.

Thank you for your attention

Thank you