Pioneering sustainable power for Business Aviation

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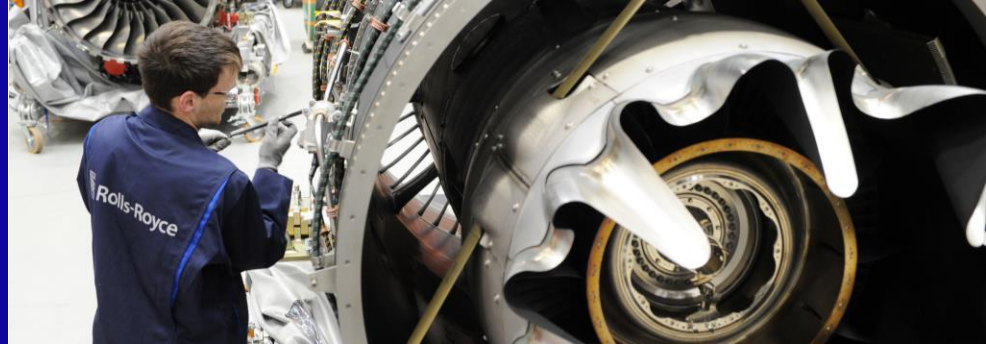
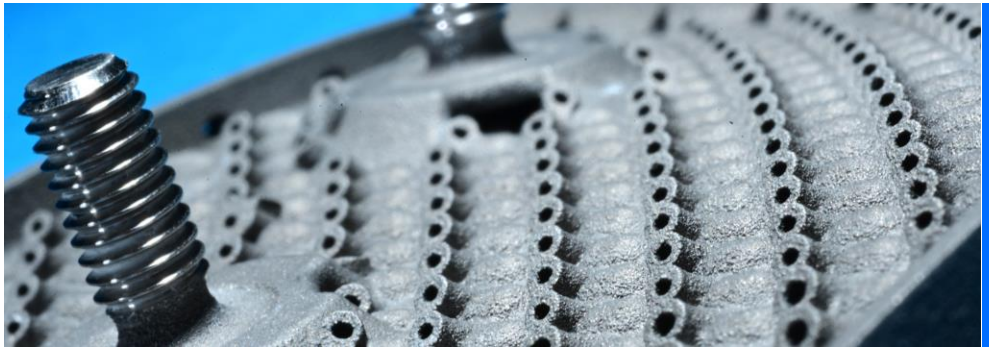
Addressing all emissions

ACARE Flightpath 2050 objectives

- Noise reduction by 65% (-15 dB)
- Reduction of CO2 emissions by 75%
- NOx reduction by 90%

Noise



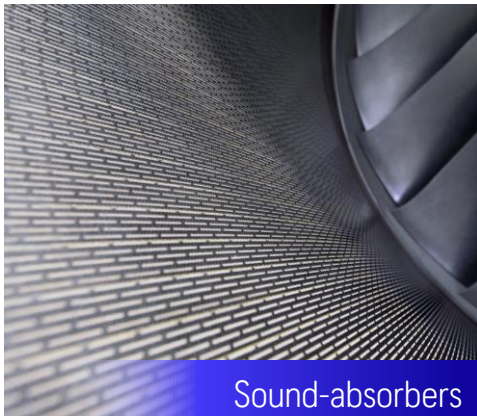


NOx

CO_2

Noise

- Continous improvement process with each new generation
- Improving all components
- Today‘s BizJets way quieter than commercial airliners with high margin to legislative CAEP levels
- Improved operational procedures, could allow more short-term benefits for most affected communities



Comparision of the lateral full-power noise levels

- While the G650 has 50% more thrust and is way bigger than the GII it is 13 EPNdB quieter
- This equates to more than halving the perceived noise
- The Pearl 700-powered Gulfstream G700 and G800 will achieve further improvemets

EPNdB (Effective perceived noise in decibels)

* Source: EASA type certicate data sheets for noise

Spey powered Gulfstream GII

102.7 EPNdB*

BR725 powered Gulfstream G650

89.8* EPNdB

	BR710 (A2-20)	Pearl 15	Improvement
Maximum thrust (lbf)	14,750	15,125*	3% higher at sea level**
Specific Fuel Consumption	Datum	7% better	7% better
Noise (Cumulative)	Stage 4 – 12 (EPNdb)	Stage 4 – 14 (EPNdb)	2 EPNdb quieter
NOx emissions (% margin to CAEP VI limits)	15%	35%	20% more margin
Smoke emissions (% margin to CAEP VI limits)	32%	80%	48% more margin

Comparision BR710 and Pearl 15

* At ISA+15; certified to 15,249
** Up to 9% higher during climb

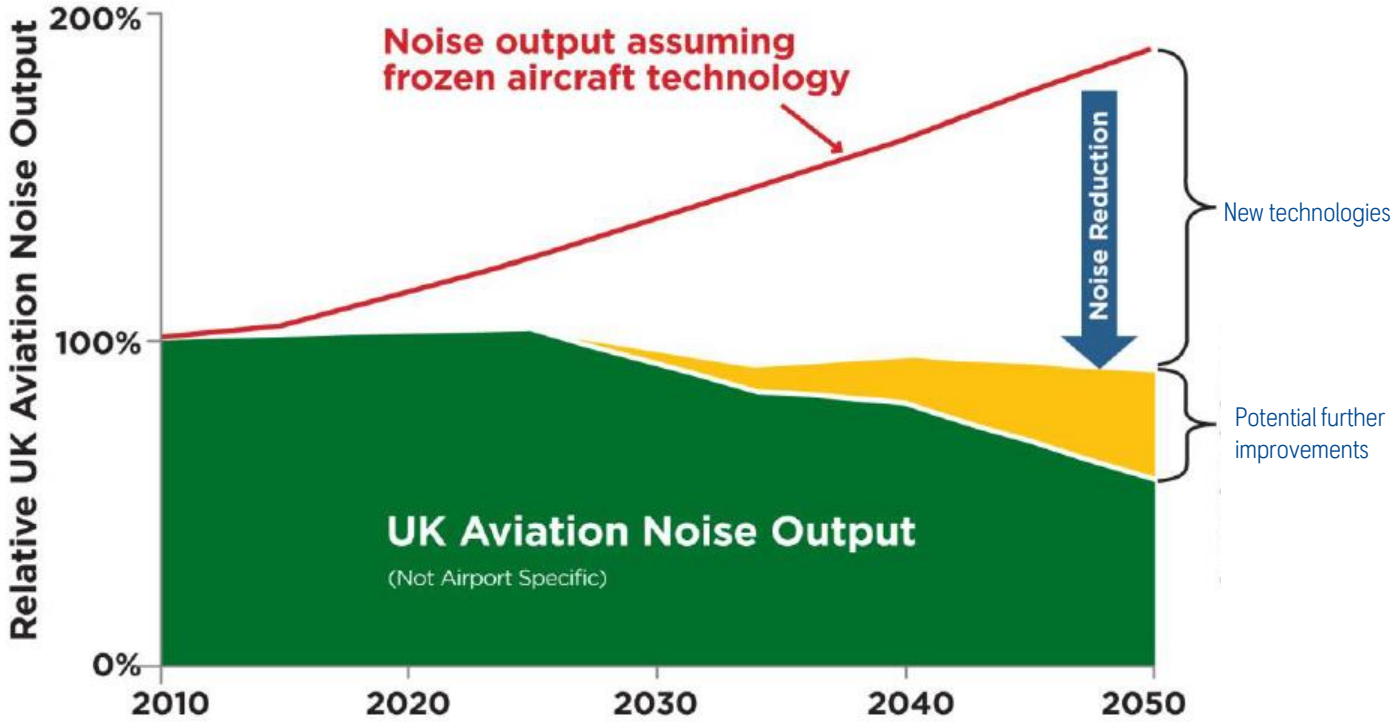
Copyright: Bombardier Aerospace

Noise outlook

Radical change of aircraft architecture and engine integration is required to meet the ACARE 2050 target for business aviation

Less noise despite growth

- Continous improvement process with each new generation



SUSTAINABLE AVIATION
Cleaner. Quieter. Smarter.

Source: "The SA Noise Road-Map" link: www.sustainableaviation.co.uk

Our journey to Net Zero carbon is all about efficiency

Solution depends on aircraft size, power and range

Super-efficient gas turbines will power the majority of aircraft out to 2050

Our approach is to maximise the efficiencies available to continually improve our in-service fleet while we research and develop options for future aircraft

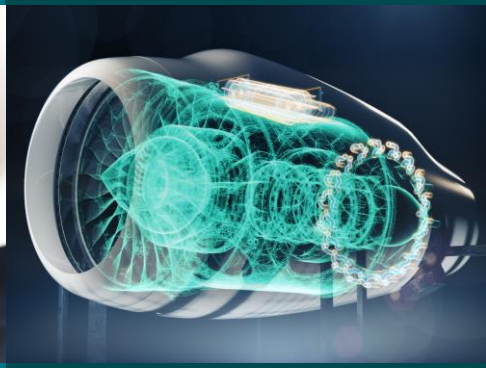
Maximise efficiency of current and future fleets +

Less fuel

Ensure fleets are compatible with 100% SAF +

Greener fuel

Develop alternatives such as electric and hydrogen

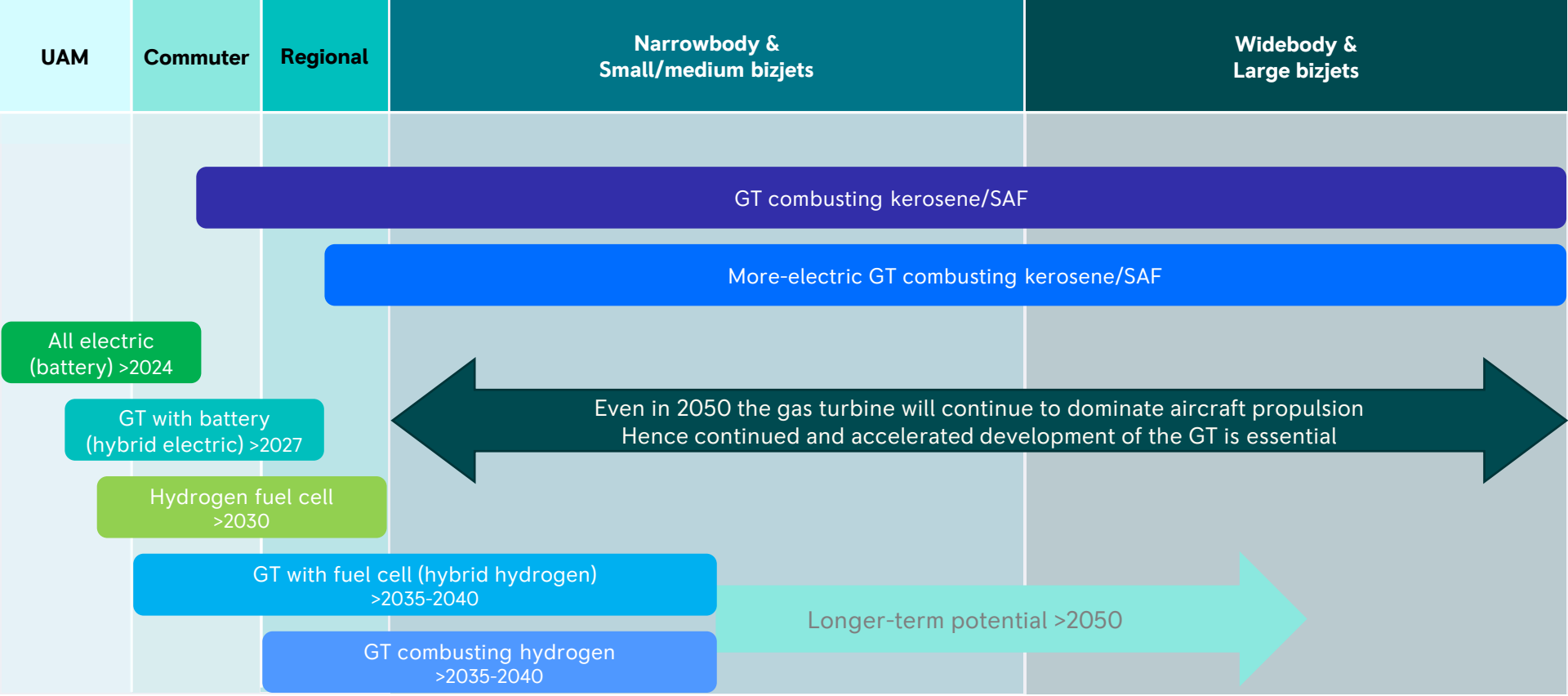


Zero-carbon energy

Aircraft installation and integration

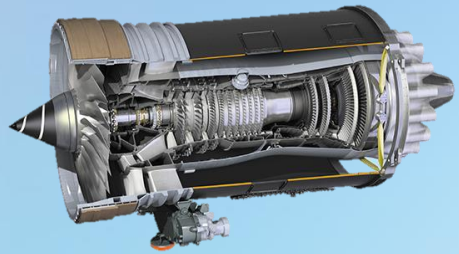
In-service support

Manufacturing and Operations

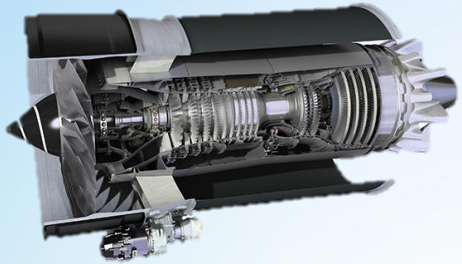


Civil Aerospace market and technology landscape to 2050

BR710
Gulfstream GV/G550
EIS 1997

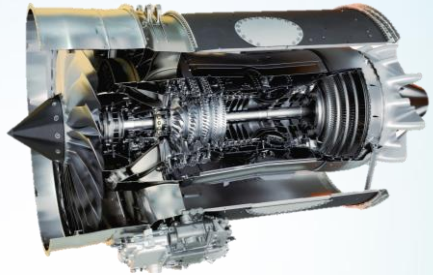


BR725
Gulfstream G650
EIS 2012



4% better sfc

Pearl 700
Gulfstream G700/G800
EIS soon



5% better sfc

SFC improvements

SAF plays crucial role in reaching net zero carbon

- Potential for **80%+ reduction in CO_2 emissions** over life cycle
- Proving compatibility with **100% SAF** for existing products in service by end of 2023
- Engine testing in Dahlewitz, Derby and Bristol now uses **10% SAF blend** (~0.8 mio gallons a year)
- **SAFinity** service for BizAV customers launched


ROLLS
ROYCE