



Accelerating Advances in Environmental Performance

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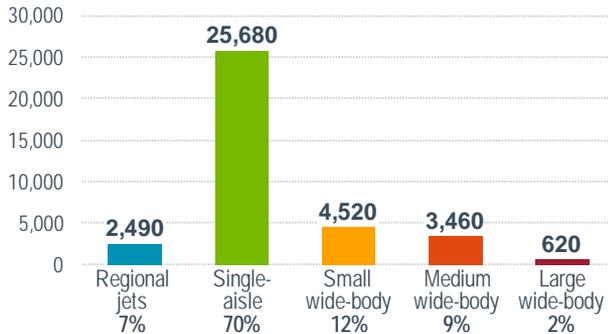
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37,000 airplanes needed over the next 30 years

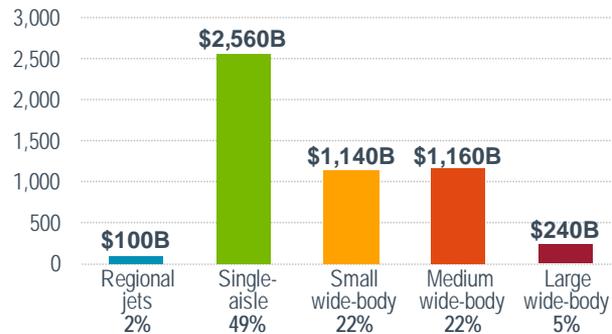
Airplane deliveries: 36,770

2014 - 2033



Market value: \$5.2T

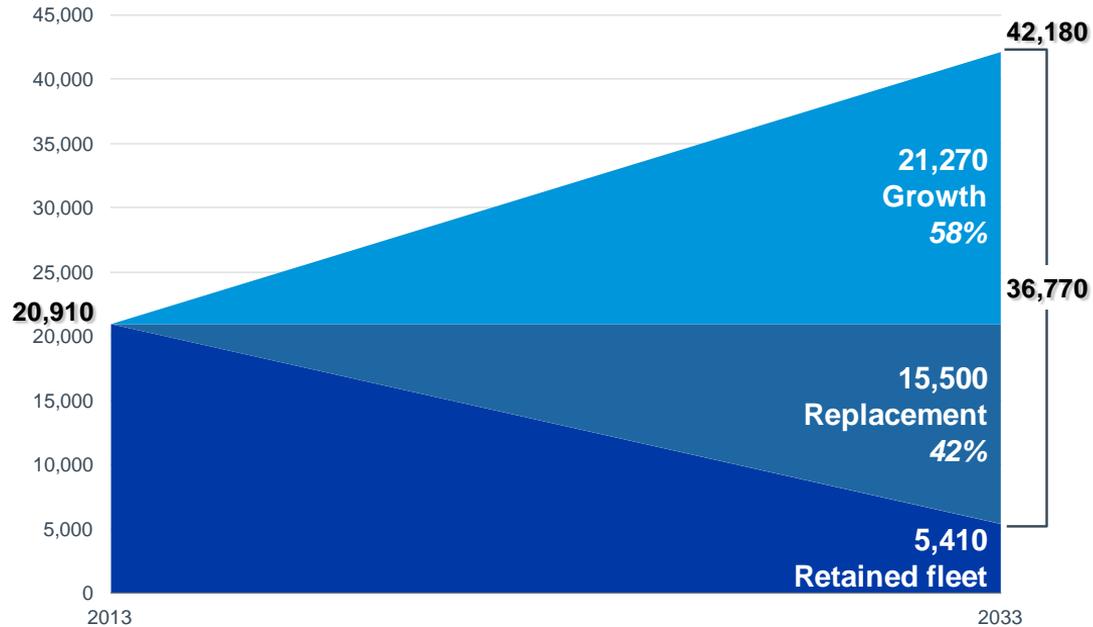
2014 - 2033





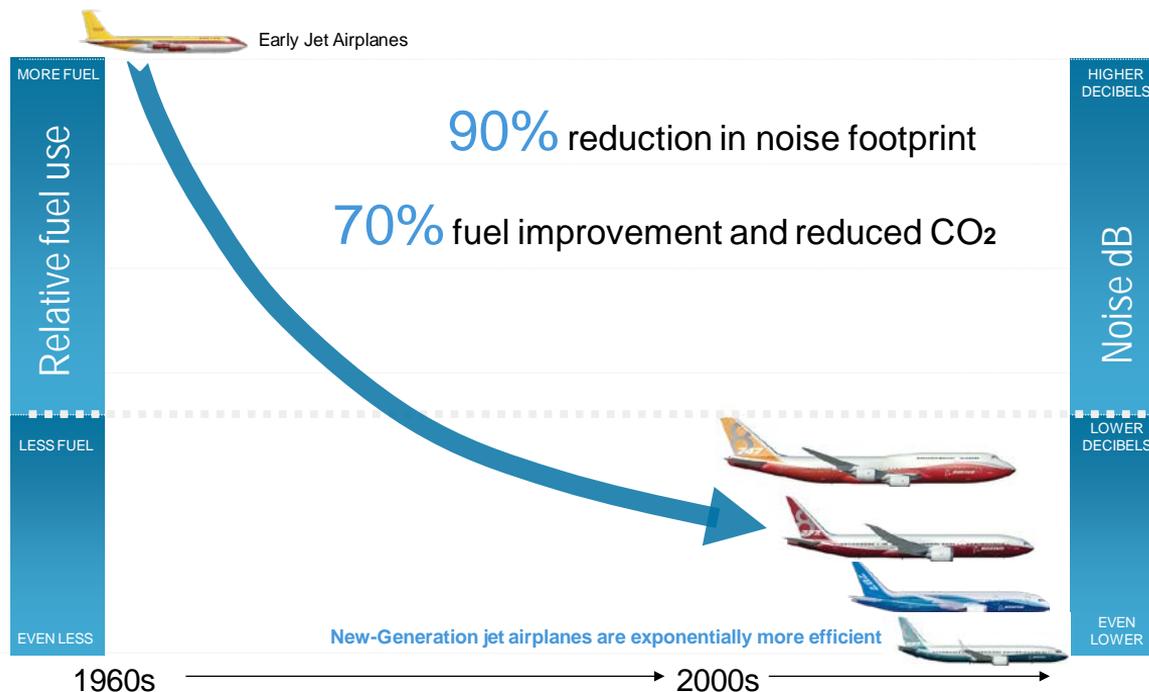
New More Efficient & More Advanced Airplanes will Replace the Aging Fleet

Units





Every generation gets cleaner, quieter, and more fuel efficient





Advanced Technologies will make the 777X more environmentally efficient

Largest composite wing

Enhanced flight deck

Advanced engines and nacelles

Innovative systems technologies

Exclusive aerodynamic technologies



Cleaner, quieter and more efficient

- 12%* more CO₂ efficient
- 29% below 2008 industry limits for NO_x
- Better than LHR QC 0.5 and future ICAO Stage



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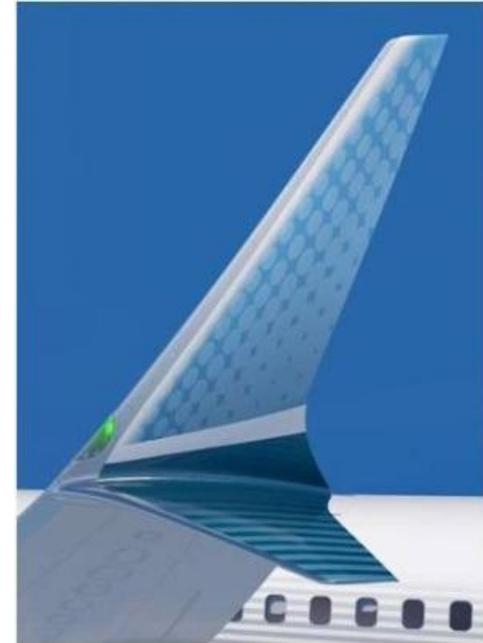


We are going to improve aviation's environmental performance

Accelerate innovative and environmentally progressive technologies that:

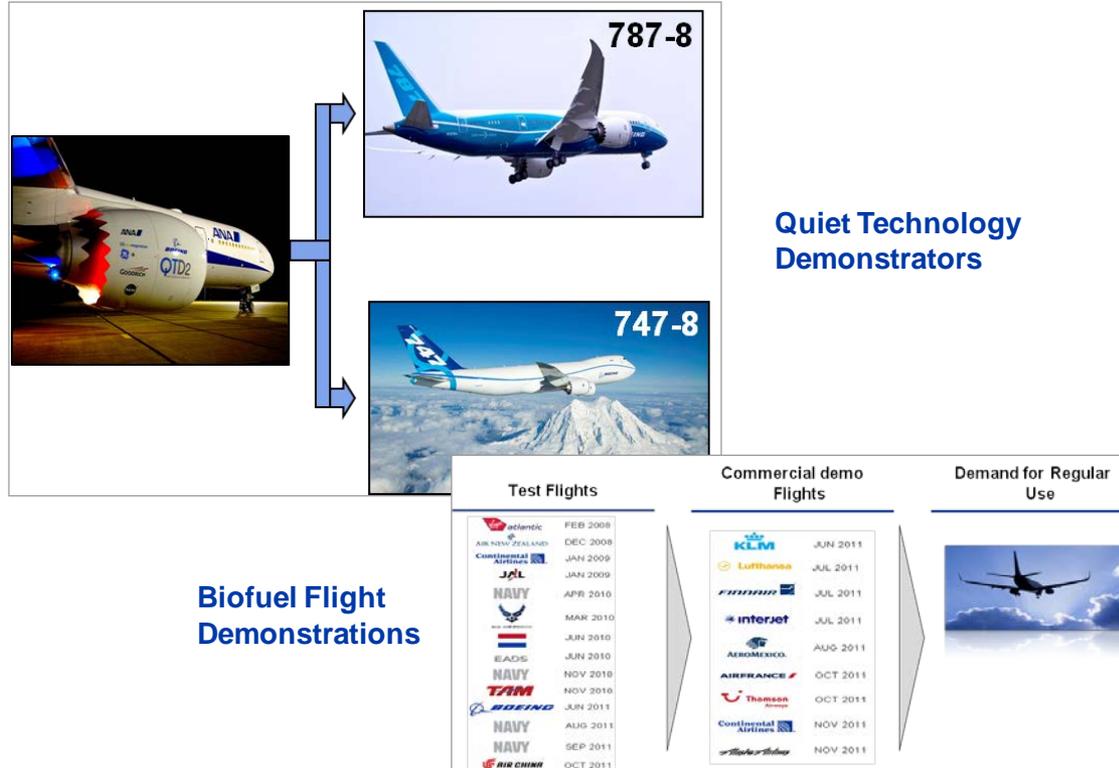
- Increase airplane fuel efficiency
- Decrease engine emissions
- Reduce airplane noise
- Improve the environmental footprint of manufacturing
- Increase sustainability across the airplane lifecycle

Foster a culture that supports people in creating a more sustainable future





Demonstrators Accelerate Technology





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The **eco**Demonstrator Program



To accelerate the testing, refinement and completion of new technologies that improve the environmental performance and sustainability of the airplane from design to end-of-service.



Cleaner | Quieter | More Fuel Efficient
Faster Development | Industry, Government, Supplier Partnerships



ecoDemonstrator Program 2012 Highlights



Variable Area Fan Nozzle



Adaptive Trailing Edges
(FAACLEAN)



Regenerative Fuel Cell
with IHI



Natural Laminar Flow
winglet



Flight trajectory optimization and
information management



Active Engine Vibration
Reduction



Adaptive Trailing Edge Technology

Actuated Mini Plane Flap
30 deg up to 60 deg down



Actuated Mini Split Flap
Faired to 60 deg down



Objectives

- Develop and demonstrate a prototype adaptive trailing edge system capable of tailoring wing performance to reduce noise and fuel burn at different flight regimes

Flight Test Successfully Completed

- 6 configurations (MSF, MPF, Wedges)
- Generated aero and loads data for high and low speed flight conditions
- Generated community noise data for take off and approach
- Demonstrated closed loop feedback control of mini-flap
- Successful partnership with FAA Continuous Lower Emissions, Energy, and Noise (CLEEN) Program





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787 Flight Test Airplane 2014 Technology Areas



Flight Test Efficiency

Cycle time, cost, risk management

Flight Sciences

Drag and noise reduction

Flight Deck Technologies

Operational efficiency, safety

Materials/ Manufacturing

Sustainability

Propulsion Technologies

Advanced structures

Connectivity (Technology Demonstrator)

*Situational awareness, decision support,
airplane health management*





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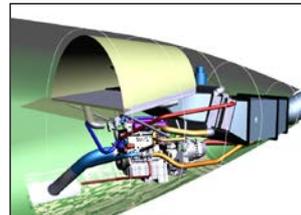
757 Flight Test Airplane 2015 Technology Areas



- Advanced Wing Concepts**
- Advanced Vertical Tail Concept**
- NextGen Cabin Sidewall Panel**
- Aircraft Obstacle Detection***
- Surface Operations Safety***

Technology Pipeline

- Interior recycling
- ATM improvements
- *Others to come.....*



*Technology Demonstrator



In Summary

- **Market demand is large**
- **Customers require more fuel efficient, cleaner and quieter airplanes to be competitive**
- **Need for advancing technology led to the **eco**Demonstrator Program**
- **The **eco**Demonstrator Program inspires us to continue pioneering ways to improve the environmental performance and sustainability of aviation**

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Thank you