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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

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

Units

- Retained fleet: 5,410
- Replacement: 15,500 (42%)
- Growth: 21,270 (58%)

Total: 42,180
Every generation gets cleaner, quieter, and more fuel efficient

90% reduction in noise footprint
70% fuel improvement and reduced CO₂

New-Generation jet airplanes are exponentially more 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 NOₓ
- Better than LHR QC 0.5 and future ICAO Stage

* Relative to the A350-1000
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

Biofuel Flight Demonstrations

Quiet Technology Demonstrators

Test Flights

Commercial demo Flights

Demand for Regular Use
The ecoDemonstrator 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 (FAA CLEEN)
- Regenerative Fuel Cell with IHI
- Natural Laminar Flow winglet
- Flight trajectory optimization and information management
- Active Engine Vibration Reduction
Adaptive Trailing Edge Technology

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
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*
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 ecoDemonstrator Program

• The ecoDemonstrator Program inspires us to continue pioneering ways to improve the environmental performance and sustainability of aviation
Thank you