Commercial Airplanes
Product Development

Innovation for Sustainable Aviation

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Aviation Is Integral to Today’s Society

Aviation brings together **people**, **countries** and **cultures**

36.4 million flights worldwide
transporting **3.3 billion passengers**

Provides **58.1 million jobs** globally

$2.4 trillion global economic impact

38,000 new airplanes over the next 20 years

Source: 2015 International Air Transport Association Industry Facts 2015
Sustainable Future

World in 2050

- Population growth and urbanization - “Quality of Life”
- Globalization, global security, more connected world
- Natural resource constraints, vulnerable ecosystems
- Climate change and CO₂ emissions
- Increased, more complex international regulation and restrictions
Sustainable Aviation

Innovate | Collaborate | Inspire
Better by Design
Innovate

Improve Environmental Performance
Across the Product Life Cycle

Global Emissions and Energy

Hazardous and Sustainable Materials

Community Noise Local Emissions and Water
Aviation Sustainable Fuels
In Service

Demonstration Flights
2008 - 2011

Early commercial flights
2011-2012

Global collaboration
2012 to present

First generation biofuels - Camelina, Halophytes, Algae, Jatropha, etc.

Next generation “drop-in” sustainable aviation fuel

UNITED STATES
Green Diesel

BRAZIL
Waste Sugar Cane

SOUTH AFRICA
Solaris Tobacco
Chemical Risk Management
Materials and Manufacturing

Collaborate
to drive change in industry and supply chain

Reduce
the use of hazardous materials

Develop
new and innovative solutions

Airplane with chrome-free paint
Sustainable Materials
End of Service

- 69 member companies, global leaders across the world
- Formed in 2006 to demonstrate proactive industry action
- Best Management Practices
- Improving industry safety, environmental responsibility and sustainability

Collaboration is key to success
Learn By Doing

• Capture end-of-service best practices - dismantling, reusing and recycling
• Develop Design for Environment requirements for new design
• Promote growth of recycling and reuse markets
• Create higher residual airplane value, economically and environmentally
Boeing Composites Use

Increased use over time

Materials
- Composite
- Steel
- Titanium
- Aluminum
- Miscellaneous

747 1%

757 / 767 3%

777 11%

787 50%
Carbon Fiber Composites Recycling Tomorrow – moving towards more sustainable

Supply chain
Recycle or reuse
Continue aerospace application proof-of-concept exploration

Manufacturing
Fiber reclamation technologies

End-of-service
Waste
Develop non-aerospace recycled fiber market

Product

Recycled versus virgin fiber
- Costs 70% less to produce
- Uses 98% less energy to manufacture

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ecoDemonstrator Program
Innovate, Collaborate, Inspire

- **Accelerate innovation**
  - Learn by doing
  - Speed implementation
  - Steady Rhythm

- **Collaborate** with airlines, government, suppliers, academia and industry

- **Inspire** action
ecoDemonstrator Program
Sustainable Manufacturing Demonstrations

ecoDemonstrator 787

Recycled Carbon Fiber Wing Access Doors

ecoDemonstrator 757

Sustainable Printed Flight Deck

Flight Deck Side Wall Diffuser
Creating a Better Future Together