



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

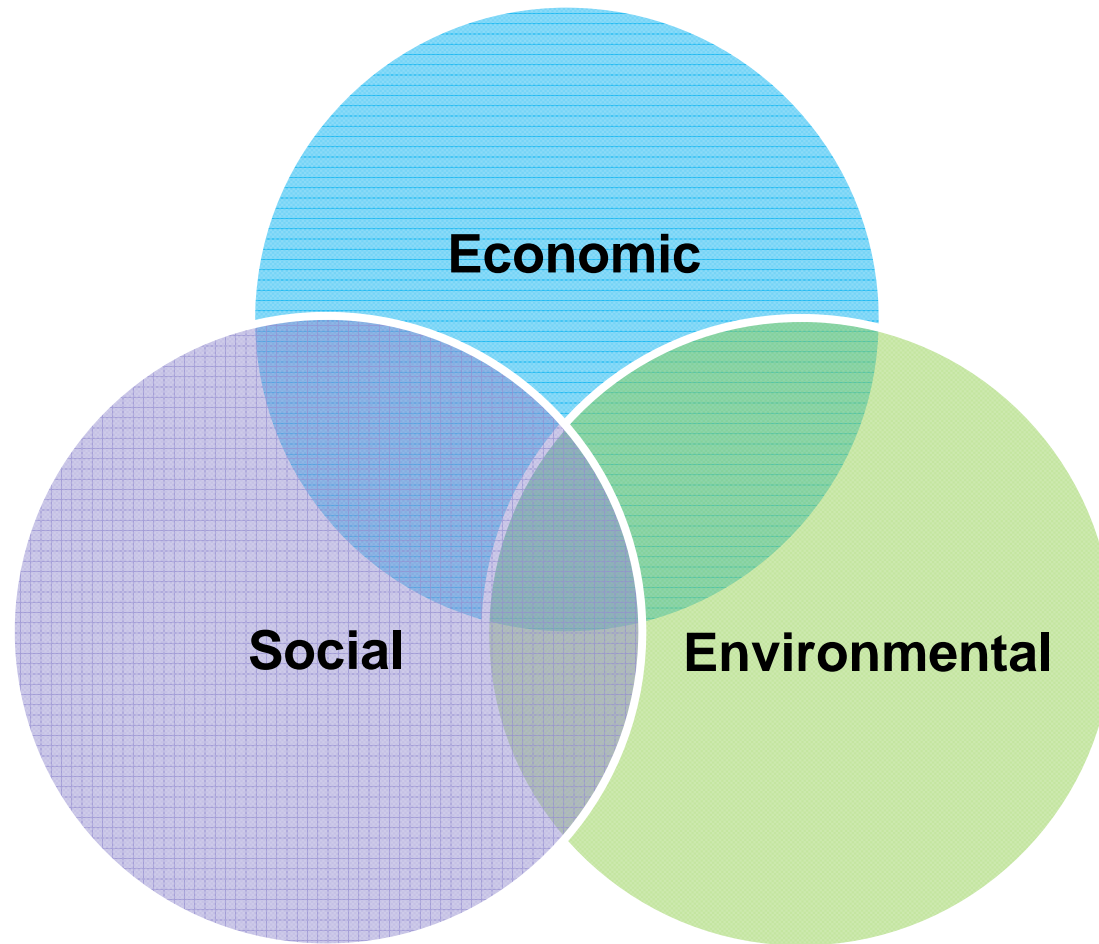
Sustainable Future



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

Global Emissions
and Energy



Hazardous and
Sustainable
Materials



Community Noise
Local Emissions
and Water



Across the Product Life Cycle



Aviation Sustainable Fuels In Service

Demonstration Flights 2008 - 2011



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

Early commercial flights 2011-2012



Global collaboration 2012 to present



UNITED STATES
Green Diesel



BRAZIL
Waste Sugar Cane



SOUTH AFRICA
Solaris Tobacco

**Next generation “drop-in”
sustainable aviation fuel**

Chemical Risk Management

Materials and Manufacturing

Collaborate
to drive change in
industry and supply chain



IAEG

INTERNATIONAL AEROSPACE
ENVIRONMENTAL GROUP

ICCAIA SUPPORTS INTERNATIONAL
CONSORTIUM SEEKING ALTERNATIVES
TO HALON FIRE SUPPRESSANT



Reduce
the use of hazardous
materials

Develop
new and innovative
solutions



Airplane with chrome-free paint

AFRA
Aircraft
Fleet
Recycling
Association

- ## Founding Members



ecoDemonstrator 757

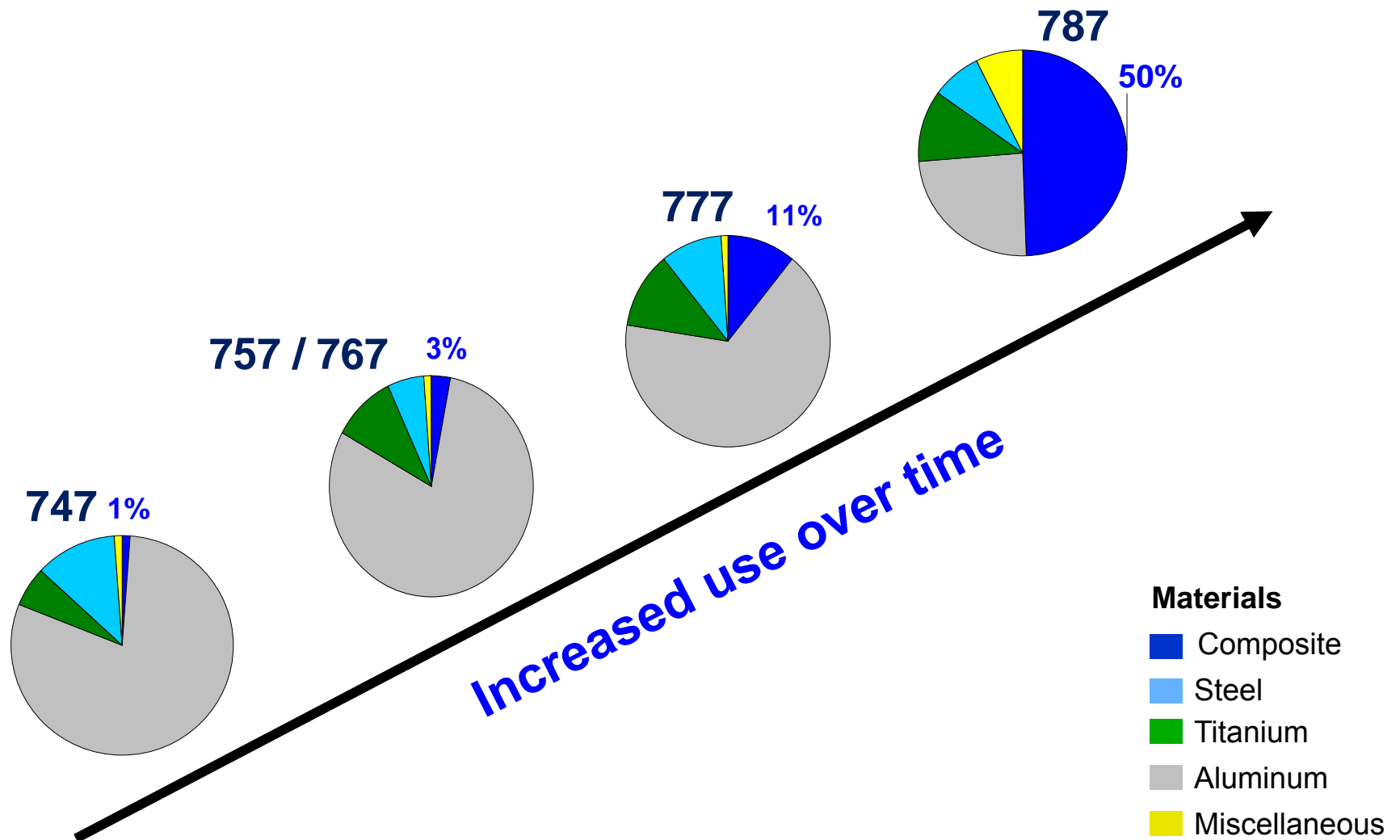
End of Service



Learn By Doing

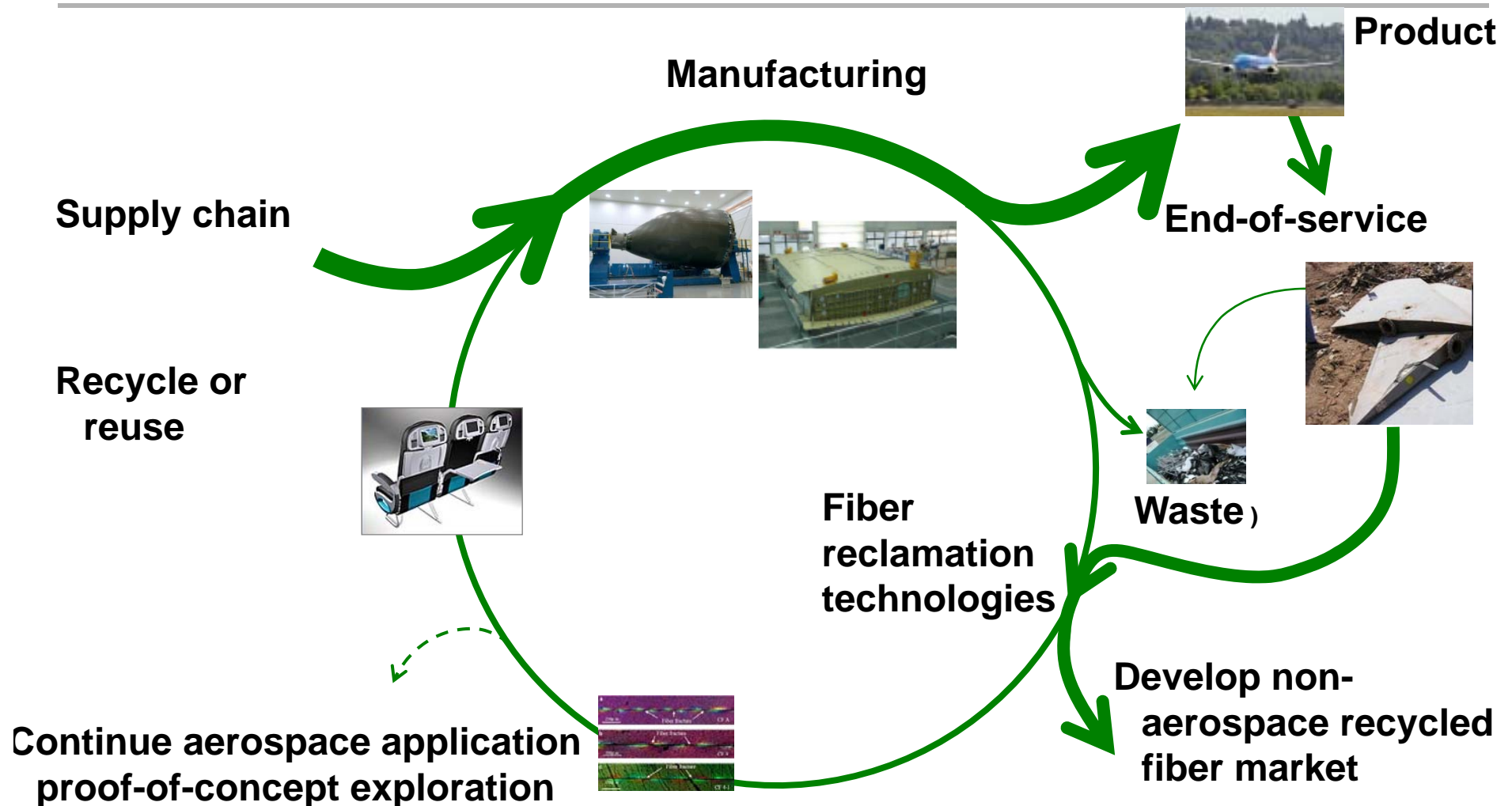
- Capture end-of-service best practices - dismantling, reusing and recycling
- Develop Design for Environment requirements for new design
- Promote growth of recycling and reuse markets
- Create higher residual airplane value, economically and environmentally

Boeing Composites Use



Carbon Fiber Composites Recycling

Tomorrow – moving towards more sustainable



--- Exploratory

Recycled versus virgin fiber

- Costs 70% less to produce
- Uses 98% less energy to manufacture

ecoDemonstrator Program

Innovate, Collaborate, Inspire

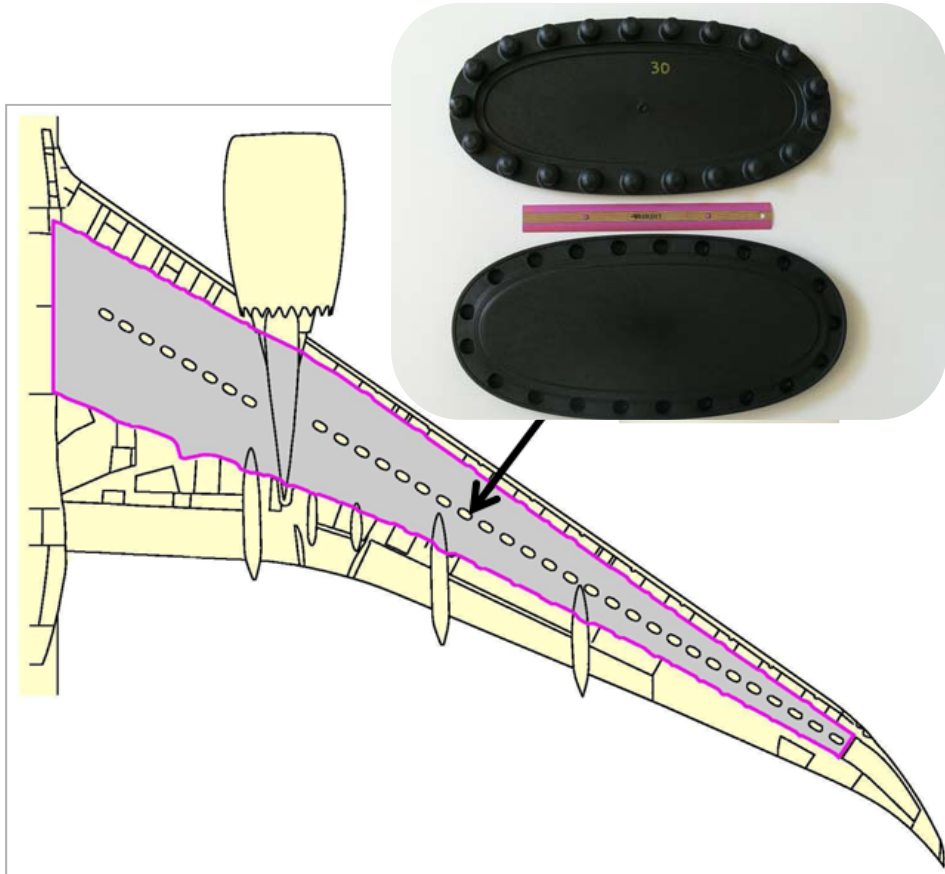


- **Accelerate innovation**
 - Learn by doing
 - Speed implementation
 - Steady Rhythm
- **Collaborate** with airlines, government, suppliers, academia and industry
- **Inspire** action

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

