Technology Development at Boeing – an international effort

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Global Technology

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1903 – Wright Brothers

1916 – Boeing Airplane Co.

Today

Our corporate offices are located in Chicago, with branch offices in Washington, D.C., and Seattle.
100 years ago...
"If rate of new knowledge is 4 times as fast, then planning for 2031 today is the equivalent of being in 1890 trying to plan for 2006"
Past Predictions

This **telephone** has too many shortcomings to be seriously considered as a means of communication.

- *Western Union internal memo, 1876*

Heavier-than-air **flying machines** are impossible.

- *Lord Kelvin, president, Royal Society, 1895*

I think there is a world market for maybe five **computers**.

- *Thomas Watson, chairman of IBM, 1943*

**640K** ought to be enough for anybody

- *Bill Gates, founder of Microsoft, 1981*
Boeing has a Diversified Aerospace Portfolio
Customers’ Needs Drive Technology Characteristics

...to meet the customer needs (range, payload, speed, mission effectiveness, availability, reliability, etc.)

... in development, production, operations, and support.

... non-polluting in production; quiet; non-polluting & fuel efficient in operation; disposable/ recyclable at end of life

... easy to mod; open system architecture; easy to upgrade
Boeing Research & Technology Provides a Centrally Managed R&D Organization

Boeing Commercial Airplanes

Integrated Defense Systems

Air Traffic Management (ATM) system’s newest laboratories are demonstrating the technologies and capabilities that will make up the future ATM system.
$1 Trillion in Technology Is Being Developed Throughout the World

North America $374 B
Europe $280 B
Middle East $13 B
Asia $313 B
South America $19 B
Africa $7 B
Aus. & NZ $15 B

Total: $1.02 trillion
Growth: 7.7%
Updated: 9/2008

R&D Funding

Industry 64%
Gov 32%
Other (Univ.'s and non-Profits) 4%

Source: Organization of Economic Cooperation and Development (OECD) and UNESCO
Boeing Collaborates with Talent From Around the World

- Canada
- United Kingdom
- Netherlands
- Denmark
- Germany
- Ukraine
- Russia
- Japan
- China
- Brazil
- Australia
- South Africa
- India
- Singapore

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Today’s Products Demand Technologies that Require Increasing Levels of Integration

Engineering, Operations & Technology | Boeing Research & Technology

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Future Generations

Value Chain

- SOS*
- Systems
- Sub-Assembly
- Sub-Systems
- Components
- Technologies, Processes, Tools

Now

• SOS = System of Systems
Boeing 747
Launched -- March 1966
First Flight -- February 1969
Number of Models -- 17 total
-100/SR/B, 200, 200F, 200C, SP, 200M, 300M, 300/SR, 400, 400M, 400D, 400F, 400ER, 400ERF, -8

Number of Parts/Aircraft (without fasteners) -- ~3,000,000

Number of Aircraft Delivered -- ~1,400
Boeing 747 Development History

- 1960: 747-100/SR/B Launch
- 1965: 747-200 Roll-Out
- 1970: 747-200C
- 1975: 747SP
- 1980: 747-300/SR
- 1985: 747-200M
- 1990: 747-300M
- 1995: 747-400
- 2000: 747-400M
- 2005: 747-400D
- 2010: 747-400ER
- 2010: 747-8 Coming Soon

Design reuse
Technology reuse
Process reuse
Knowledge reuse
Aviation has made steady, significant progress

Early Jet Airplanes

Second Generation Jet Airplanes

New Generation Jet Airplanes

90% Reduction in Noise Footprint
70% Fuel Improvement and Reduced CO₂

Nose footprint based on 85 dBA.
Selected Technology Domains

Engineering, Operations & Technology | Boeing Research & Technology

- Systems Engineering
- Support and Services
- Networked Systems
- Platform Systems/Subsystems
- Platform Performance
- Environment
- Structures
- Manufacturing

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Selected Technology Pursuits

Hydrogen Fuel Cell with zero emissions

Robotic inspection systems

Investing in Technology today directly relates to our competitiveness in the future
2008

- Example: Fuel Cell Demonstrator Airplane research project
- Conducting experimental flight tests of a manned single-seat propeller-driven airplane powered only by a fuel cell and lightweight batteries.
• Diamond supplied airframe and modifications in support of successful fuel cell demonstrator program.
Selected Technology Pursuits – Intelligent Systems and Robotics
Selected Technology Pursuits – Platform Systems and Subsystems

- Example: Automated Aerial Refueling
- Demonstrating an unmanned air vehicle's ability to autonomously maintain a steady refueling station behind a tanker aircraft.
Selected Technology Pursuits – Network Systems

Example: Biological Assessment System and Border Protection

Developing a system that will assess damage and collateral effects, employing breakthrough operational capabilities to locate, track, collect and detect simulated biological agents in a designated area.
Austrian technology and innovation is helping the 787 to achieve its objectives in passenger comfort and environmental performance.

- **Boehler Schmiedetechnik** developed parts for the landing gear, slat tracks and engine mounts of the 787.

- **Fischer Advanced Composite Components (FACC) AG** produces composite components for the 787 engines, nacelles, wings and fuselage.

- **TTTech** provides airplane electronics subsystems.

- **Austriamicrosystems AG** provides electronic subsystems
• Technology and innovation play a key role in developing environmentally preferred commercial air transports for the future.

• Boeing is looking for suppliers and partners to be actively engaged in developing value-added technologies for the future.

• Working together, we can ensure successful technology development and insertion.

• Collaborative joint concept and architecture development is a keystone.