Aviation Safety Overview
Past, Present and Future

Terry McVenes, Director
System Safety and Regulatory Affairs
Boeing Commercial Airplanes
Learning Objectives

- Understand the history of aviation safety
- Develop an understanding of current aviation safety challenges & priorities
- Learn the role of the manufacturer in promoting aviation safety
Class Outline

- Background
- Historical Perspective of Aviation Safety
- Aviation Safety in 2014
- Looking Forward: the 21st Century Challenge
Personal Background

- Engineering
- Airline Pilot
- Safety Profession
First Commercial Airline Flight
London to Sydney in 2 Hours?
### Issues Facing Pilots—Then and Now

<table>
<thead>
<tr>
<th>Then</th>
<th>Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving Equipment</td>
<td>Security</td>
</tr>
<tr>
<td>Developing Standard Procedures</td>
<td>Automation</td>
</tr>
<tr>
<td>Avoiding Terrain</td>
<td>Flight &amp; Duty times</td>
</tr>
<tr>
<td></td>
<td>Volcanic Ash</td>
</tr>
<tr>
<td></td>
<td>Laser Exposure</td>
</tr>
<tr>
<td></td>
<td>Runway Safety</td>
</tr>
<tr>
<td></td>
<td>Criminalization</td>
</tr>
</tbody>
</table>
“Risk management is a more realistic term than safety. It implies that hazards are ever-present, that they must be identified, analyzed, evaluated and controlled or rationally accepted.”

— Jerome Lederer, former director of the Flight Safety Foundation for 20 years and NASA's first director of Manned Flight Safety.
A Basic Tenet
Aviation Safety Responsibilities Are Shared

Government
- Airworthiness requirements
- Manufacturing quality
- Safe operating environment

Manufacturers
- Safe airplane design
- Manufactured in conformity to the approved design
- Initial operating & maintenance manuals
- In service safety

Operators
- Operated safely
- Maintained properly

Air Safety
Historical Perspective of Aviation Safety
U.S. and Canadian Operators Accident Rates by Year

Annual fatal accident rate (per million departures)

Year

1993 Through 2012

- Rest of World
- U.S. & Canadian Operators
# Fatal Commercial Accidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Accidents</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>14</td>
<td>405</td>
</tr>
<tr>
<td>1960</td>
<td>11</td>
<td>559</td>
</tr>
<tr>
<td>1973</td>
<td>18</td>
<td>1,258</td>
</tr>
<tr>
<td>1985</td>
<td>17</td>
<td>1,984</td>
</tr>
<tr>
<td>1994</td>
<td>15</td>
<td>865</td>
</tr>
<tr>
<td>2013</td>
<td>11</td>
<td>195</td>
</tr>
</tbody>
</table>
20 Year Worldwide Fatal Accident Rate: 1993–2012
The U.S. Journey—Historical Perspective

- **US Airways Altitude Awareness Program**
- **1st ASAP MOU signed between American Airlines and FAA**
- **CAST established**
- **ASAP Programs established by US Airways and United Airlines**

**Technology Advancements**

- **Airlines FOQA programs established by US Airways and United Airlines**
- **First data sharing forums**
- **ASIAS implemented**

**What is next?**
The U.S. Journey—Historical Perspective

- 1st ASAP MOU signed between American Airlines and FAA
- US Airways Altitude Awareness Program
- Airlines FOQA programs established by US Airways and United Airlines
- ASIAS implemented
- First data sharing forums
- CAST established
- ASAP Programs established by US Airways and United Airlines
- 20-Year Fatal Accident Rate


What is next?

Technology Advancements

- 1.5 US Airways Altitude Awareness Program
- 1.0
- 0.5
- 0.0
Boeing Safety Leadership: Working together for a Safe and Efficient Global Air Transportation System today and in the future.
Application of Lessons Learned

- New Technology
- Previous DR&O
- Regulatory reqmts
- Customer reqmts

Boeing DR&O and regulatory requirements

Design

Design Changes

Changes to production airplanes

Validate and Certify

Service bulletins, procedure changes, training, etc.

In-Service Safety Process

In-Service Operation

Delivery

Fleet DATA

Continuous feedback of information

Lessons Learned

Design Changes
Accident Rates by Region of the World
2003 through 2012

Western-built transports >60,000-pounds hull loss accidents, by airline domicile

Accidents per million departures

World
1.3
1.1
0.8

United States & Canada
0.5
0.4
0.3

Latin America & Caribbean
2.9
2.3
1.8

Europe
0.8
0.7
0.5

Middle East
3.8
2.3
1.8

Africa
9.7
8.3
5.6

China
1.1
0.3
0.1

CIS
7.1
2.6
1.6

Asia (excluding China)
2.2
2.1
1.4

Oceania
0.2
0.0
0.0

Copyright © 2009 Boeing. All rights reserved.

Fatal Accidents – Worldwide Commercial Jet Fleet

Fatalities

- Mid-Air Collision: 506
- Runway Excursion (T/O & Ldg): 973
- Runway Incursion: 209 - 2002–2011, 0
Looking Forward: The 21st Century Challenge
Continuous Safety Improvement Required as Departures Increase

Annual hull loss accidents
Annual departures, millions
Annual hull loss accident rate per million departures
The Future of Aviation Safety
It’s All About Data
Technology and Innovation

Structure
- Composite materials

Propulsion
- Next-generation engines

Aerodynamics
- Advanced aerodynamics

Systems
- Innovative
Aviation and the Environment

- Environmentally progressive products and services
- Advanced global air traffic management concepts
- Renewable fuel and energy solutions
“Life is a culmination of the past, an awareness of the present, an indication of the future beyond knowledge, a quality that gives a touch of divinity to matter.”

Charles Lindbergh
Questions