

# **Lessons Learned From Aviation Accidents**

## **Creation of a Web-Based Knowledge System**

**Presented to: International Fire and Cabin Safety  
Research Conference**

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Federal Aviation Administration**

**Date: October 25-28, 2010  
Atlantic City, New Jersey**



**Federal Aviation  
Administration**

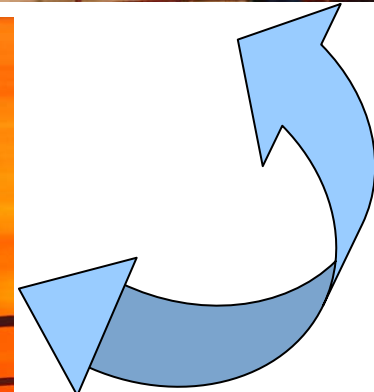
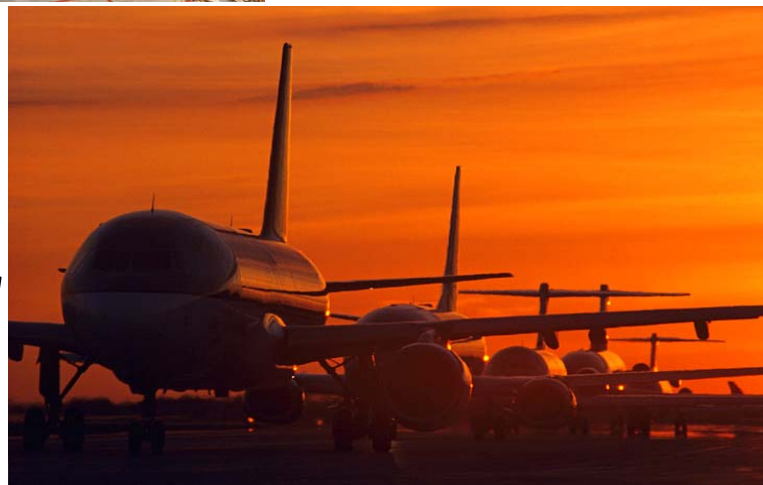
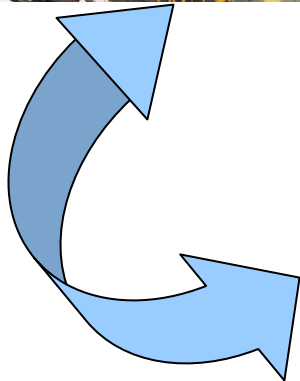
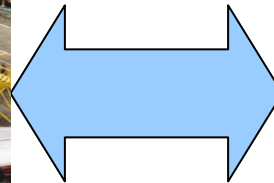


# Background



- During the 1990's and early 2000's, several large transport accidents occurred which prompted examination of the consistency of:
    - The **design** programs
    - The **operational** programs
    - The **maintenance** programs
- and the **organizational interfaces** connecting these programs

# Organizational Interfaces



# Organizational Interface Accidents:

- Trans World Airways Flight 800
- Swissair Flight 111
- American Eagle Flight 4184
- Alaska Airlines Flight 261



# Alaska Airlines 261

-The catalyst for an internal review of safety processes

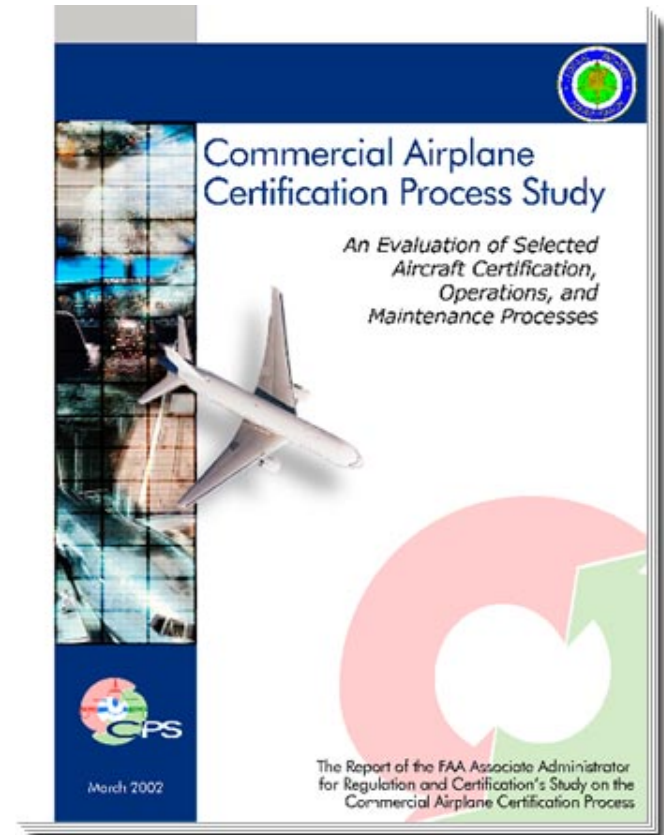


At the NTSB accident hearing in 2000, the FAA committed to undertake a detailed review of its certification and operational processes

- In March 2002, the Certification Process Study (CPS) was issued

# Commercial Airplane Certification Process Study

- Study co-chaired by FAA and industry, supported by experts from several major companies and organizations

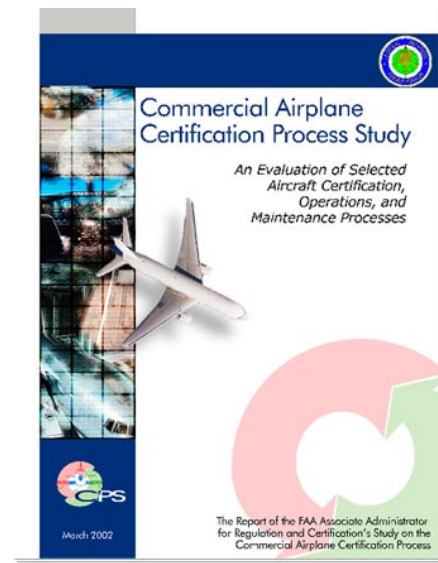


Web accessible at: [http://www.aia-aerospace.org/issues/subject/faa/faa\\_cert\\_study.pdf](http://www.aia-aerospace.org/issues/subject/faa/faa_cert_study.pdf)

# CPS Report Finding #8:

***“Adequate processes do not exist ... within the commercial aviation industry...to ensure that the lessons learned from specific experience ... are captured...and made available to the aviation industry...”***

**Mistakes can be linked to failure to apply past lessons**



**“Those who cannot remember the past are condemned to repeat it.”**

George Santayana  
Professor of Philosophy  
Harvard University  
The Life of Reason, Volume I  
1905

**Nearly all large transport accidents are enormous human tragedies. A second tragedy is to not learn from them.**





# Current Situation



- **Lessons from major accidents are not being consistently captured, retained, or applied**
  - **Reliance of “On the Job Training” (OJT)**
  - **Intended to be captured by requirements, specifications**
  - **“That’s an old accident. Why do I need to know anything about that?”**
  - **“Not my job”**

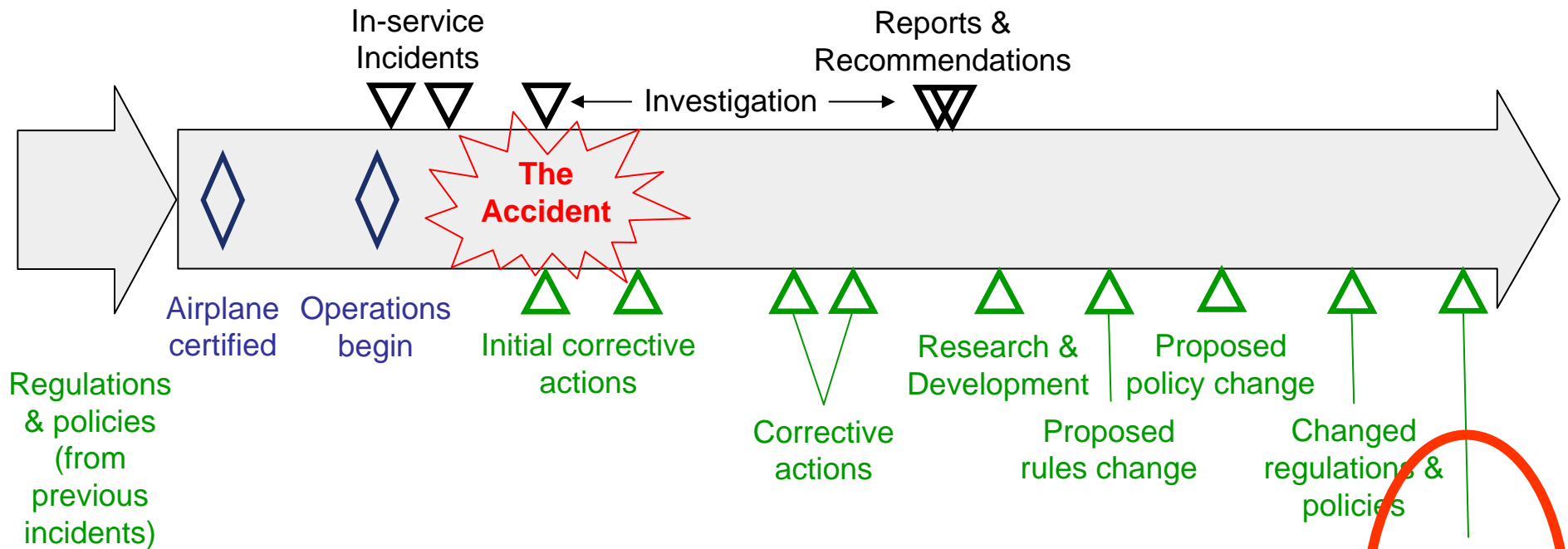
# Barriers to Creating an Accident Knowledge System



- **Fear of litigation, negative publicity**
- **Lengthy Investigation/Resolution**
- **Continual workforce turnover**
- **IT tools only recently available**

# Accident Life Cycle

## Investigation Process



## Resolution Process

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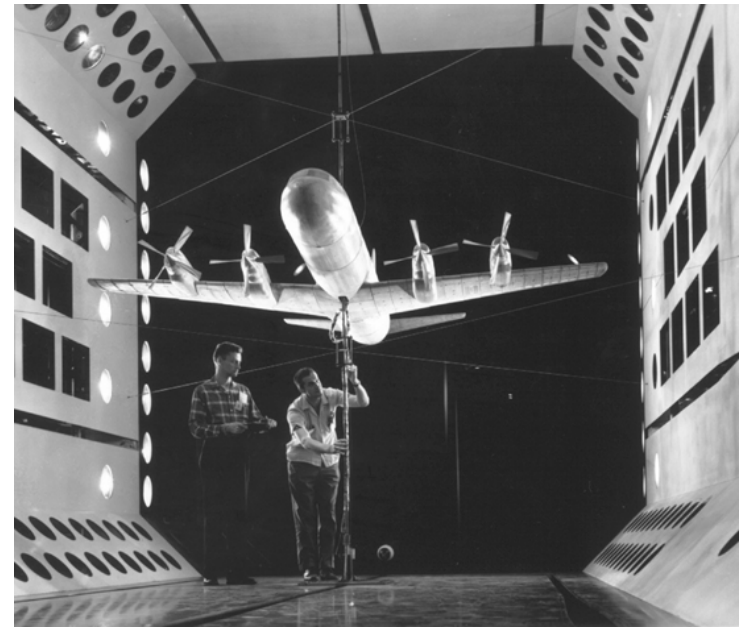
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# Current Initiative



- In response, the FAA has developed a web based ***“Lessons Learned from Transport Airplane Accidents”*** library
  - Structured; threat based
  - Comprehensive search/sort capability
  - Can be integrated with other safety systems

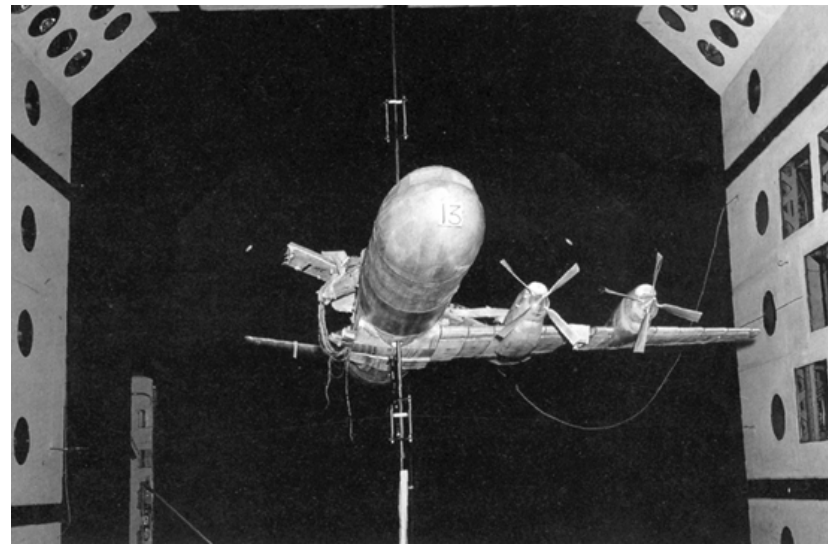
# Library Content



## What the Library IS:

- An orderly assemblage of available accident information
- Investigation AND resolution content

# Library Content



## What the Library is NOT:

- Re-investigation of any accident
- Assessment of *fault* or *blame*
- A collection of all accidents; only those with high lesson value

# Accident Causes

-multiple factors



- **Often accidents require several factors in order for the accident to happen**
  - All the factors “line up” on a given flight

# Accident Causes

-usually not new cause



- **Rarely do today's accidents occur for causes never experienced before**
  - Most accidents involve circumstances similar, if not identical to previous accidents or incidents



# Precursor Recognition



- **Timely and appropriate accident precursor recognition can aid in accident prevention**
  - Those involved in the safety delivery process are now able to gain knowledge of accident causes

# Accident Intervention



- **Strategic removal of one of the key factors can break the accident chain before all the factors “line up”**
  - Effective intervention begins with knowledge
  - Training of these factors is now possible

# Purpose of Accident Library



- **Stop and reverse the loss of costly lessons**
- **Maintain and improve the safety of an already very safe international aviation system**
  - Training modules are possible using library content

# Accident Library Arrangement

The screenshot shows a Windows Internet Explorer browser window displaying the FAA website. The address bar shows the URL <http://accidents-ll.faa.gov/>. The browser's Favorites bar includes links to 'ANM Phone Directory', 'Aviation Safety - Informatio...', 'AVS Dashboard', 'AVS QMS Site', 'FAA Employee Site', 'FIND', 'LL3Library', 'TAD', and 'Web Slice Gallery'. The website header features the FAA logo and the title 'Lessons Learned From Transport Airplane Accidents Home'. Below the header is a navigation menu with links: 'View All Accidents', 'Airplane Life Cycle', 'Accident Threat Categories', 'Accident Common Themes', 'Searching / Sorting', and 'Site Map'. A breadcrumb trail indicates 'You Are Here: Lessons Learned Home'. The main content area is titled 'Lessons Learned From Transport Airplane Accidents' and includes a 'Subscribe to Page' button. The text explains that international commercial air travel has reached levels of safety and convenience that were unimaginable just a generation ago, and that the FAA, with support from many others, plans to continue adding to the material on an annual basis. It also describes the 'Arrangement of the library', which uses three different 'perspectives' to arrange accidents: 'Airplane Life Cycle', 'Accident Threat Categories', and 'Accident Common Themes'. Each perspective is represented by a grid of small images. The 'Airplane Life Cycle' grid shows images of an airplane on the ground, in flight, and being inspected. The 'Accident Threat Categories' grid shows images of an airplane on the ground, in flight, and being inspected. The 'Accident Common Themes' grid shows images of an airplane on the ground, in flight, and being inspected. At the bottom of the page, there are links to 'FAA.gov Home', 'Privacy Policy', 'Web Policies & Notices', 'Contact Information', and 'Help', along with the release date 'Release 6, 6/11/2010' and a list of 'Readers & Viewers' including 'Flash Player', 'PDF Reader', 'MS Word Viewer', 'MS PowerPoint Viewer', 'MS Excel Viewer', and 'WinZip'. The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time '11:32 AM'.

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# Life Cycles (3)

The screenshot shows a Windows Internet Explorer browser window displaying the FAA website. The address bar shows <http://accidents-ll.faa.gov/>. The page title is "Lessons Learned From Transport Airplane Accidents - Windows Internet Explorer". The website header includes the FAA logo and the text "Federal Aviation Administration" and "Lessons Learned From Transport Airplane Accidents Home".

Navigation tabs include: [View All Accidents](#), [Airplane Life Cycle](#), [Accident Threat Categories](#), [Accident Common Themes](#), [Searching / Sorting](#), and [Site Map](#). A breadcrumb trail shows "You Are Here: [Lessons Learned Home](#)".

### Lessons Learned From Transport Airplane Accidents




[Subscribe to Page](#)

International commercial air travel has reached levels of safety and convenience which would have been unimaginable just a generation ago. Although almost always extremely tragic events, the lessons from accidents have played an important role in the process to continue improving this safety.

This Lessons Learned From Aviation Accidents library represents some of the most major accidents and their related lessons. The U. S. Federal Aviation Administration, with support from many others, plan to continue adding to this material on an annual basis. The objective is to populate the material with many more of the most historically significant, policy shaping accidents, in order that the lessons that can be learned from their review may be available to all users of the library.

#### Arrangement of the library

Three different "perspectives" are used to arrange the accidents in this library and illustrate the complex interrelationship of accident causes. Each accident also contains at least one high level lesson related to a threat element, and at least one lesson related to a theme element. View each of these perspectives and their related elements by clicking in the areas below.

Airplane Life Cycle	Accident Threat Categories	Accident Common Themes
<a href="#">Return to main screen</a>	To continue, select one of the options below or click one of the headers above for additional options.	
 Design / Manufacturing	 Operational	 Maintenance / Repair / Alteration

Footer: [FAA.gov Home](#) | [Privacy Policy](#) | [Web Policies & Notices](#) | [Contact Information](#) | [Help](#) Release 6, 6/11/2010

Readers & Viewers: [Flash Player](#) | [PDF Reader](#) | [MS Word Viewer](#) | [MS PowerPoint Viewer](#) | [MS Excel Viewer](#) | [WinZip](#)



# Threat Categories (18)

The screenshot shows a web browser window displaying the FAA website. The page title is "Lessons Learned From Transport Airplane Accidents". The main navigation bar includes "View All Accidents", "Airplane Life Cycle", "Accident Threat Categories", "Accident Common Themes", "Searching / Sorting", and "Site Map". The "Accident Threat Categories" section is highlighted in orange. Below this section, there are three columns of categories, each with a radio button. The categories are:

- Airplane Life Cycle:** Explore Categories by clicking on an option to the right.
- Accident Threat Categories:**
  - Weather Hazards
  - Cabin Safety / Hazardous Cargo
  - Flight Deck Layout / Avionics Confusion
  - Crew Resource Management
  - Fuel Exhaustion
  - Fuel Tank Ignition
  - Inclement Weather / Icing
  - Incorrect Piloting Technique
  - In-flight Upsets
  - Lack of System Isolation / Segregation
  - Landing / Takeoff Excursions
  - Midair / Ground Incursions
- Accident Common Themes:**
  - Pressurization / Decompression Failures
  - Structural Failure
  - Uncommanded Thrust Reversal
  - Uncontrolled Fire
  - Wing Failure

At the bottom of the page, there is a footer with links for "FAA.gov Home", "Privacy Policy", "Web Policies & Notices", "Contact Information", and "Help". The release date is "Release 6, 6/11/2010".

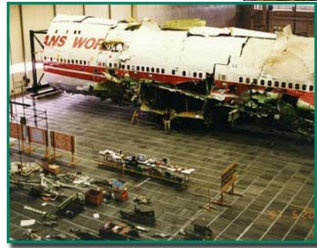
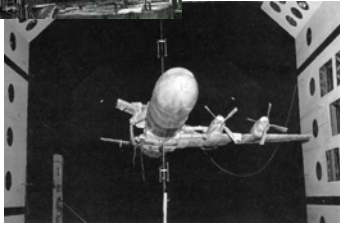


# Common Themes (5)

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# Plans



Prototype

Library Release

Ongoing

Accidents Library Total Content

10 accidents

30 accidents

50 accidents +

2007

2008

2009



# Summary



- **A web-based Accident Library is now available to enhance the safety of an already very safe international aviation system**
  - Currently available at: <http://accidents-II.faa.gov/>

# Demo of the LL Library

Federal Aviation Administration

Lessons Learned From Transport Airplane Accidents Home

[View All Accidents](#) [Airplane Life Cycle](#) [Accident Threat Categories](#) [Accident Common Themes](#) [Searching / Sorting](#) [Site Map](#)

You Are Here: [Lessons Learned Home](#)

### Lessons Learned From Transport Airplane Accidents

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Airplane Life Cycle	Accident Threat Categories	Accident Common Themes

- **At tomorrow's conference workshop, the accident library, and related lessons, will be reviewed in the areas of:**
  - **Uncontrolled Fire**
  - **Cabin Safety/Hazardous Cargo**