Historical Fatal Accident Rate
U.S. Commercial Operations

Fatality Accidents (or Full Loss Accident Equivalents) per 10 Million Departures

5 year moving average of fatal accidents per 10 million departures

82% Reduction in Actual Fatal Accident Rate 1996-2007

Initial Era of CAST

Vision - Mission - Goals

Vision
- Key aviation stakeholders acting cooperatively to lead the world-wide aviation community to the highest levels of global commercial aviation safety by focusing on the right things.

Mission
- Enable a continuous improvement framework built on the proactive identification of current and future risks, developing mitigations as needed and monitoring the effectiveness of implemented actions.

Future Goals
- Reduce the U.S. commercial aviation fatality risk by at least 50% from 2010 to 2025
- Continue to work with our international partners to reduce fatality risk world-wide commercial aviation.
Government, industry and labor collaborate to develop a voluntary, prioritized safety agenda.

Industry

Commercial Aviation Safety Team (CAST)

**Observers**
- IATA**
- AAPA**
- ATAC**
- APFA**
- ACI-NA**

Government

DOD
- FAA
  - Aircraft Certification
  - Flight Standards
  - System Safety
  - Air Traffic Operations
  - Research

NASA
- EASA (ECAST)
- TCC

* Representing P&W and RR
Robust CAST Methodology

- Detailed event sequence - problem identification from worldwide accidents and incidents
- Broad-based teams (45-50 specialists /team)
- Over 450 problem statements (contributing factors)
- Over 900 interventions proposed
- Analyzed for effectiveness and synergy
CAST Safety Strategy & Process

Data Analysis

• Rigorous Methodology
• Set Safety Priorities
• Cost/Benefit Analysis

Implement U.S. Safety Enhancements

Influence Worldwide Safety Enhancements

Integrate into existing work and distribute

Agree on problems and interventions

Joint Safety Analysis Team (JSAT)

“Problem Statement”

Achieve consensus on solution feasibility and priority

Joint Safety Implementation Team (JSIT)

“Solution Development”

Joint Implementation Measurement Data Analysis Team (JIMDAT)

“Execution”
JSAT Process – Subject Matter Expertise

- Review Data
- Record Characteristics/Indicators
- Develop Event Sequence
- Identify Problems
- Identify Intervention Strategies
- Global Review of Characteristics/Indicators
- Evaluate Problem Importance
- Assign Standard Problem Statements
- Evaluate Intervention Effectiveness
- Prioritize Interventions
- Technical Review & Report Results

WHO, WHAT, WHEN, WHY?

*Certification, Flight Standards, Air Traffic, Accident Investigation/Prevention

- ALPA/APA
- FAA AIR*
- FAA AFS*
- FAA ATO*
- FAA AVP*
- Airbus
- EASA
- ATA
- AIA
- Boeing
- Transport Canada

*Certification, Flight Standards, Air Traffic, Accident Investigation/Prevention
Joint Safety Implementation Team (JSIT)

- JSIT develops a safety enhancement based on:
  - Technical feasibility of the intervention
  - Resources available
    - Financial impact
    - Capability for operational deployment
    - Schedule of phased implementation
  - Regulatory compatibility of the intervention
  - Sociological aspects
- JSIT prepares a Detailed Implementation Plan ("DIP")
Joint Implementation Measurement Data Analysis Team (JIMDAT)

Measuring the effectiveness of Mitigations
JIMDAT Develops a Prioritization Methodology

- Identifies the most effective solutions derived from all accident categories
- Considers effectiveness vs. resources
- Tests solutions against fatal and hull loss accidents
- Creates draft master strategic safety plan
- Identifies areas for future study/mitigation
# Direct Accident Costs

**JIMDAT Accident Set (1987 – 2005)**

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Injury/Medical/Legal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatality</td>
<td>$5,932,700</td>
<td>1,951 $11,574,697,700</td>
</tr>
<tr>
<td>Serious Injury</td>
<td>$1,992,533</td>
<td>243 $484,185,519</td>
</tr>
<tr>
<td>Minor Injury</td>
<td>$55,750</td>
<td>545 $30,383,750</td>
</tr>
<tr>
<td><strong>Hull Loss</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actual Replacement Costs</td>
<td></td>
<td>73 $470,610,000</td>
</tr>
<tr>
<td><strong>Maintenance and Repair</strong></td>
<td>$3,811,000</td>
<td></td>
</tr>
<tr>
<td>Non-Hull Loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Airline Immediate Response</strong></td>
<td>$1,000,000</td>
<td>73 73,000,000</td>
</tr>
<tr>
<td><strong>Loss of Reputation</strong></td>
<td>$150,000,000</td>
<td>49 7,350,000,000</td>
</tr>
<tr>
<td><strong>Bereavement</strong></td>
<td>$150,000</td>
<td>84 $12,600,000</td>
</tr>
<tr>
<td><strong>Site Clearance</strong></td>
<td>$1,980,000</td>
<td>73 $144,540,000</td>
</tr>
<tr>
<td><strong>Total Flight Cycles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$/FC</td>
<td>$100.70</td>
<td></td>
</tr>
<tr>
<td><strong>Airline Immediate Response:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[once per each Hull Loss Accident]</td>
<td>Crisis management center, passenger information, media information</td>
<td></td>
</tr>
<tr>
<td><strong>Loss of Reputation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[once for Accident with consequence &gt;50%]</td>
<td>Society may be more conservative in flying with that airline or on the aircraft type</td>
<td></td>
</tr>
<tr>
<td><strong>Bereavement:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[once per Accident]</td>
<td>Notify family members, monitor search and recovery, arrange a memorial service</td>
<td></td>
</tr>
<tr>
<td><strong>Site Clearance:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[once per each Hull Loss Accident]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Resource Cost Vs. Risk Reduction

- 48% Risk Reduction in 2007
- 68% Risk Reduction in 2007
- 74% Risk Reduction in 2020
- 80% Risk Reduction in 2020

- $350M in 2007
- $470M in 2007
- $740M in 2020
- $5B

- 47 Completed Safety Enhancements
- 47 Completed SEs & Planned SEs (2007 Implementation Level)
- Completed SEs & Planned SEs (2020 Implementation Level)
- All JSIT Proposed SEs (2020 Implementation Level)
Cost Savings (2010 Dollars)

Part 121 Aviation Industry Costs Due to Fatal Hull Loss Accidents

Historical cost of accidents per flight cycle

Savings ~ $74/Flight Cycle or ~ $814 Million Dollars/Year

$26.18 per flight cycle

Cost of accident fatalities following implementation of the CAST plan @ 2020 levels

Dollars/Flight Cycle

2007

2020
Current CAST Safety Plan

- Projected 74% fatality risk reduction by 2020
  - Industry and Government implementing plan
- 61 Completed Safety Enhancements addressing:
  - Safety Culture
  - Maintenance Procedures
  - Flight Crew Training
  - Air Traffic Controller Training
  - Uncontained Engine Failures
  - Terrain avoidance warning system (TAWS)
  - Standard Operating Procedures
  - Precision Approaches
  - Minimum Safe Altitude Warning (MSAW) Systems
  - Proactive Safety Programs (FOQA + ASAP)
CAST Safety Plan (continued)

22 Committed Safety Enhancements

- Policies and Procedures
- Aircraft Design
- Flight Crew Training (additional aspects)
- Runway Incursion Prevention
- Precision Approaches (additional projects)
- Icing (additional turboprop projects)
- Midair
- Maintenance
- Runway Safety
- Safety culture, policies and procedures
Calculating Potential Benefit of a Safety Enhancing Intervention

\[
\text{Accident Risk Reduction} = f(\text{Effectiveness}, \text{Portion of world fleet with intervention implemented})
\]

Did we do what we said we would do?

Was it Effective?
Aviation Safety Information Analysis & Sharing (ASIAS)

- Share voluntarily collected safety data
- Develop tools to make data analysis more efficient
- Identify and access key data sources
- Discover potential aviation safety risks using key data sources
- Transition to Decision Making Based on Analysis of Incident and System Safety Performance Data
- Develop automated information integration capabilities centered on aviation safety risk topics
- Transfer technologies and key data sources into National Archives
ASIAS Enables Various Types of Proactive Safety Analyses

- Known Risk Monitoring
- Vulnerability Discovery
- Benchmarking Opportunity for participating Air Carriers
- CAST Safety Enhancement Assessments
- Directed Studies
Data Sources Supporting ASIAS Studies

Proprietary Data
- ASAP
- FOQA
- ATSAP
- Manufacturers data
- Avionics data

Safety Data
- Aviation Safety Reporting System
- Runway Incursion
- Surface Incident
- Operational Error / Operational Deviation
- Pilot Deviation
- Vehicle or Pedestrian Deviation
- National Transportation Safety Board
- FAA Accident/Incident Data System
- FAA Service Difficulty Reports

ATC Information
- Traffic Management Reroutes and Delays
- Airport Configuration and Operations
- Sector and Route Structure
- Procedures
- Surveillance Data for En Route, Terminal and Airport

Other Information
- Bureau of Transportation Statistics
- Weather / Winds
As of 10 November 2011

40 Airlines

32 have a FOQA program
40 have an ASAP program

Air Wisconsin Airlines
AirTran Airlines
Alaska Airlines
American Airlines
American Eagle Airlines
Atlantic Southeast Airlines
Chautauqua Airlines
CitationAir
Colgan Air
Comair
CommutAir
Compass Airlines
Continental Airlines
Delta Air Lines
Empire Airlines
ExpressJet
Frontier Airlines
GoJet Airlines
Gulfstream Int’l Airlines
Hawaiian Airlines

JetBlue Airways
Mesa Airlines
Mesaba Airlines
Miami Air International
North American Airlines
Piedmont Airlines
Pinnacle Airlines
PSA Airlines
Republic Airlines
Shuttle America
SkyWest Airlines
Southwest Airlines
Spirit Airlines
Sun Country Airlines
Trans States Airlines
United Airlines
United Parcel Service
US Airways
USA 3000 Airlines
World Airways

As of 10 November 2011
ASIAS is Governed by Formal Principles

- Data used solely for advancement of safety
- Non-punitive reporting
- Airline data is de-identified
- Analyses approved by an ASIAS Executive Board
## ASIAS Studies In Progress or Completed

<table>
<thead>
<tr>
<th>Directed Studies</th>
<th>Runway Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terrain Awareness Warning System Study</td>
</tr>
<tr>
<td></td>
<td>TCAS Resolution Advisories</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CAST Known Risk and Safety Enhancement Effectiveness Monitoring</th>
<th>Risk of Landing Runway Overrun</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach and Landing Accident Risks</td>
</tr>
<tr>
<td></td>
<td>Controlled Flight Into Terrain (CFIT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airline Benchmarks</th>
<th>Terrain Awareness Warning System Alerts</th>
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<td></td>
<td>Unstabilized Approaches</td>
</tr>
<tr>
<td></td>
<td>TCAS Resolution Advisories</td>
</tr>
</tbody>
</table>
Success relies on collaboration between voluntary safety programs.

Aviation Community
Emerging Safety Concerns
Share Best Practices

ASIAS
Analysis and Monitoring + Vulnerability Discovery

CAST
Safety Enhancement Implementation

AVIATION INFOSHARE
ASIAS
CAST

M & E
Flight Ops
ATSAP
Cabin
Dispatch
FOQA

Flight Ops
Cabin
Dispatch
ATSAP
M & E
FOQA
http://www.cast-safety.org/