1.1 . . . Reduce Fatal Accident Rate . . .

- . . . Strategic Plan to Improve Safety . . .
- . . . Improve Safety Worldwide . . .
CAST brings together key stakeholders to cooperatively develop and implement a prioritized safety agenda.

Commercial Aviation Safety Team

Industry
- A4A
- AIA
- Airbus
- ALPA
- ACI-NA
- CAPA
- IATA**
- NACA
- Boeing
- GE*
- RAA
- FSF

Government
- DOD
- FAA
- NASA
- ICAO**
- TCCA
- NATCA
- NTSB**
- EASA**

* Representing P&W and RR
** Observer
CAST came together in 1997 to form an unprecedented industry-Government partnership.

- Voluntary commitments, data-driven risk management, implementation-focused.
- Goal:

  Original: Reduce the US commercial aviation fatal accident rate 80% by 2007.

  New: Reduce the U.S. commercial aviation fatality risk by at least 50% from 2010 to 2025.
CAST SAFETY STRATEGY

Data Analysis

Agree on problems and interventions

Set Safety Priorities

Achieve consensus on priorities

Implement Safety Enhancements (SE) – United States

Influence SEs – Worldwide

Integrate into existing work and distribute
RESOURCE COST VS. RISK REDUCTION

Risk Eliminated by Safety Enhancements

<table>
<thead>
<tr>
<th>Year</th>
<th>Risk Reduction</th>
<th>Total Cost in $ (Millions)</th>
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<tbody>
<tr>
<td>2007</td>
<td>25%</td>
<td>$500</td>
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<tr>
<td>2020</td>
<td>100%</td>
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</table>

Approved Plan

Resource Cost ($ Millions)

Completed
- Completed (2007 Implementation Level)
- Completed + Plan (2020 Implementation Level)
- All JSIT Proposed Enhancements (2020 Implementation Level)
Cost Savings

Part 121 Aviation Industry Cost Due to Fatal/Hull Loss Accidents

Historical cost of accidents per flight cycle

74% Risk reduction

Savings ~ $71/Flight Cycle
or
~ $852 Million Dollars/Year

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

- Completed, 76
- Underway (R&D), 10
- Underway, 25
- Underway (R&D), 11
<table>
<thead>
<tr>
<th>SE</th>
<th>Title</th>
<th>Output</th>
<th>Lead Organization</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>SE 127</td>
<td>Cargo - Cargo Fire Management</td>
<td>Output 5</td>
<td>JIMDAT</td>
<td>8/31/2017</td>
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<tr>
<td>SE 186</td>
<td>TCAS - Sensitivity Level Command</td>
<td>Output 4</td>
<td>FAA AJI</td>
<td>12/31/2017</td>
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<td>SE 199</td>
<td>ASA - Training - Enhanced Crew Resource Management Training</td>
<td>Output 2</td>
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<tr>
<td>SE 213</td>
<td>RNAV - Safe Operating and Design Practices for STARs and RNAV Departures</td>
<td>Output 2</td>
<td>FAA AFS/A4A</td>
<td>8/31/2017</td>
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<td>RNAV - Safe Operating and Design Practices for STARs and RNAV Departures</td>
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<td>RE - Airline Operations and Training - Takeoff Procedures and Training</td>
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<td>SE 218</td>
<td>RE - Design - Overrun Awareness and Alerting Systems</td>
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<td>SE 227</td>
<td>TOMC - Air Carrier Procedures for Takeoff Configuration</td>
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<td>SE 227</td>
<td>TOMC - Air Carrier Procedures for Takeoff Configuration</td>
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<td>SE 227</td>
<td>TOMC - Air Carrier Procedures for Takeoff Configuration</td>
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<td>SE 228</td>
<td>TOMC - Airplane Design Features to Facilitate Proper Takeoff Configuration</td>
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<td>AIA</td>
<td>10/31/2017</td>
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<tr>
<td>SE 229</td>
<td>TOMC - Takeoff Configuration Warning System Maintenance and Operational Assurance</td>
<td>Output 1</td>
<td>AIA</td>
<td>10/31/2017</td>
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</table>
FATALITY RISK
(EQUIVALENT FULL PLANELoads)
Fatal accidents review (6):
- Four accidents with common causal factors with passenger operations
- Two accidents with causal factors specific to all cargo operations

Distinctions between cargo and passenger operations:
- Operating environment
- Logistics/support infrastructure

Key Government and industry initiatives underway:
- Cargo Focus Team
- Loadmaster Certification Working Group
- Cargo Ops Spec development
- AC 120–85A being revised
CAST Deployed SEs Applicable to Cargo Accidents

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<td>2. CFIT SOPs - One Project</td>
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<td>3. CFIT PAI-Vertical Angles (PAI 1-7, 11)</td>
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<td>10. CFIT Proactive Safety Programs (FOQA + ASAP)</td>
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<td>12. CFIT Prevention Training - One Project</td>
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<td>14. ALAR Policies (Safety Culture)-CEO and DOS more visible (1-2)</td>
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<td>15. ALAR Policies (Safety Culture)-Safety info into manuals (3)</td>
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<td>23. ALAR Flight Crew Training - One Project</td>
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<td>26. LOC Policies and Procedures - SOP - One Project</td>
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<td>27. LOC Policies and Procedures - Risk Assessment and Management - One Project</td>
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<td>29. LOC Policies and Procedures - Policies - Flight Crew Proficiency Program (2)</td>
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<td>30. LOC Training - Human Factors and Automation - One Project</td>
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<td>85. Vertical Situation Display</td>
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<td>120. TAWS Improvements (GPS)</td>
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<td>121. Cargo Loading Training and SOPs</td>
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<tr>
<td>131. Cargo Safety Culture</td>
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- Applicable
- ✓ = Implemented
### Applicable CAST SEs Not in Effect at Time of Accidents

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<tbody>
<tr>
<td>127. Fire Management</td>
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<tr>
<td>194. ASA - Standard Operating Procedures Effectiveness and Adherence</td>
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<td>198. ASA - Scenario-Based Training for Go-Around Maneuvers</td>
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<td>200. ASA - Virtual Day-VMC Displays</td>
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<td>219. ATO Policies and Procedures</td>
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<tr>
<td>223. Cargo - Hazardous Material Fires - Prevention and Mitigation</td>
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<tr>
<td>225. Cargo - Hazardous Material Fires - Containment and Suppression</td>
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</table>

**Applicable**

✓ = Implemented
CAST SE portfolio is effective in reducing risk in cargo operations.

- **JIMDAT portfolio assessment indicates a lower level of effectiveness when compared to passenger operations.**

- Continue subgroup activity to quantify differences in the cargo operating environment that may characterize a different risk signature the SEs may not be as effective in mitigating.
Conventional wisdom: same aircraft, same airports, runways, taxiways, airspace, etc.

What is the same for pilots:
- Part 121 experience requirements.
- Part 121 training requirements.

Beyond that, some risk attributes may not be so intuitive.
AIRCRAFT DEMOGRAPHICS

- Age
- Aircraft technology generation
- In production vs. out of production
- Wide-body vs. narrow-body:
  - A Boeing 777 landing on an 8,000 ft. x 150 ft. runway looks different than a Boeing 737.
- Weights:
  - Are cargo aircraft operated closer to MAX T/O & LDG weights?
Is there different risk associated with pilot experience vs. operation when a new hire with no wide-body or international experience is a pilot for a cargo operator?

- Career progression
- Right to wide-body international
- High turnover
Hub and Spoke System (sort facilities make the network work)

Freight moves at night
  - What is the day-night ratio of flying (~60% for cargo)?

How does the risk change with reduced—
  - Air traffic services (radar update, HF, etc.)?
  - Tower operations (non-tower ops, pilot controlled lighting)?
  - Aircraft Rescue and Fire Fighting (requirements not based on cargo aircraft)?
Extended-range Twin-engine Operational Performance Standards (ETOPS) requirements are based on diversion time for the most time-limiting system (usually fire suppression).

Is the oxygen supply requirement for onboard persons matched against this fire suppression time?

How is this requirement defined?
Aircraft Rescue and Fire Fighting (ARFF):
- Based on largest passenger aircraft (by aircraft length and frequency).
- Cargo aircraft often are the largest aircraft operating to/from an airport.

Flight/Duty/Rest requirements:
- How do the operational environments differ?
- How is risk is characterized and mitigated?
We welcome participation on the JIMDAT Cargo Subgroup.

Need to ensure JIMDAT understands the differences in the cargo operating environment that may characterize a different risk signature the SEs may not be as effective in mitigating.

CAST SE portfolio is available to you on the USB stick.

Please reach out to us if you have questions or thoughts.