Aug 13th, 6:45 PM - 7:45 PM

Evening Keynote Speaker — In-Flight Loss of Control Accidents in General Aviation

Earl F. Weener Ph.D.
Member, National Transportation Safety Board (NTSB)

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Loss-of-Control and General Aviation Accident Statistics

Earl F. Weener, Ph.D.
Member, NTSB
National Training Aircraft Conference
Embry-Riddle

Daytona Beach, FL     August 13, 2018
The National Transportation Safety Board (NTSB) is an independent Federal agency created by the U.S. Congress to investigate every civil aviation accident in the United States and significant accidents in the other modes of transportation, namely – marine, highway, railroad and pipeline.
What We Do

• Investigate the accident.
• Determine the probable cause of the accident.
• Propose corrective action to reduce the likelihood of a recurrence of the accident - through formal “recommendations”.
Investigative Process for Major Investigations

- Decision to launch a “Go-Team”
- IIC and other staff designated
- Arrival On-Scene
- Organizational Meeting
- Briefings and on-scene activities (i.e. fact gathering)
- Post on-scene fact gathering
- Analysis
- Report preparation – findings, PC, recommendation development
- Board Approval
- Advocacy
“Sully” Depiction of NTSB?

- Facts regarding accident accurately portrayed
- Depiction of investigation process not accurate
  - Movie needed a villain – but not the birds
  - NTSB’s objective is to determine cause, not blame
  - Investigations rely heavily upon cooperation by all of the “parties,” hence NTSB is not confrontational
  - Movie’s negative portrayal of investigation process may chill cooperation
NTSB Investigative Hearing

• Three-day public hearing June 9-11, 2009
  • Board of Inquiry Chaired by Member Robert Sumwalt

• Investigative Hearing
  • Fact-finding only
  • No conclusions
  • No assignment of fault or blame
  • No enforcement responsibilities

• Video of Hearing available on YouTube
NTSB’s Multi-Modal Mandate

- Maintain congressionally mandated independence
- Conduct objective accident investigations and safety studies
- Perform fair & objective airman/mariner certification appeals
- Advocate safety – NTSB Most Wanted List, recommendations
NTSB 2017/2018 Most Wanted List

- Eliminate Distractions
- End Alcohol and Other Drug Impairment in Transportation
- Ensure the Safe Shipment of Hazardous Materials
- Expand Recorder Use to Enhance Safety
- Improve Rail Transit Safety Oversight
- Increase Implementation of Collision Avoidance Technologies
- Prevent Loss of Control in Flight in General Aviation
- Reduce Fatigue-Related Accidents
- Require Medical Fitness
- Strengthen Occupant Protection

Backed by recommendations!
Loss of Control
2017/2018 MWL – Prevent Loss of Control in GA Flight

- On average, more than 40% fatal GA accidents were LOC during 2004 – 2016

- Most deadly flight phases
  - Approach to landing
  - Maneuvering
  - Climb
All GA Accidents

Number of accidents


Non-Fatal  Fatal Accidents

Percent Fatal: 18%

* 2017 Preliminary numbers
GA Accident Rates

Accidents per 100k Flight Hours

- Fatal
- Total

*The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
Fatal Accident Rates per 100k Flight Hours

*The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
Corporate Flying, 2008-2017

Fatal Accidents by Defining Event

- Loss of Control In-Flight: 50%
- Controlled Flight Into Terrain: 17%
- Unintended Flight Into IMC: 8%
- Undershoot/Overshoot: 8%
- Runway Excursion: 8%
- Other: 8%

Excludes cases without event data
Business Flying, 2008-2017

Fatal Accidents by Defining Event

- Loss of Control In-Flight: 40%
- Controlled Flight Into Terrain: 21%
- System/Component Failure - Powerplant: 10%
- Fuel Related: 9%
- System/Component Failure - Non-power: 4%
- Windshear/Thunderstorm: 3%
- Unknown: 3%
- Turbulence Encounter: 3%
- Other: 3%
- Low Altitude Operation: 1%
- Abrupt Maneuver: 1%

Excludes cases without event data
# Instructional Flying, 2008-2017

## Fatal Accidents by Defining Event

<table>
<thead>
<tr>
<th>Event</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Control In-Flight</td>
<td>51%</td>
</tr>
<tr>
<td>System/Component Failure - Powerplant</td>
<td>9%</td>
</tr>
<tr>
<td>Midair</td>
<td>7%</td>
</tr>
<tr>
<td>Controlled Flight Into Terrain</td>
<td>6%</td>
</tr>
<tr>
<td>Unknown</td>
<td>5%</td>
</tr>
<tr>
<td>Abrupt Maneuver</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
<tr>
<td>Low Altitude Operation</td>
<td>3%</td>
</tr>
<tr>
<td>System/Component Failure - Non-power</td>
<td>2%</td>
</tr>
<tr>
<td>Fuel Related</td>
<td>2%</td>
</tr>
<tr>
<td>Collision on Takeoff or Landing</td>
<td>2%</td>
</tr>
<tr>
<td>Ground Handling</td>
<td>2%</td>
</tr>
<tr>
<td>Unintended Flight Into IMC</td>
<td>1%</td>
</tr>
<tr>
<td>Simulated/training event</td>
<td>1%</td>
</tr>
<tr>
<td>Loss of Control on Ground</td>
<td>1%</td>
</tr>
<tr>
<td>Abnormal Runway Contact</td>
<td>1%</td>
</tr>
<tr>
<td>Turbulence Encounter</td>
<td>1%</td>
</tr>
<tr>
<td>Security Related</td>
<td>1%</td>
</tr>
</tbody>
</table>

Excludes cases without event data
Fatal Accidents by Defining Event

- Loss of Control In-Flight: 46%
- System/Component Failure - Powerplant: 11%
- Controlled Flight Into Terrain: 8%
- Unintended Flight Into IMC: 5%
- System/Component Failure - Non-power: 5%
- Unknown: 4%
- Other: 4%
- Fuel Related: 3%
- Low Altitude Operation: 3%
- Midair: 2%
- Collision on Takeoff or Landing: 2%
- Abrupt Maneuver: 1%
- Abnormal Runway Contact: 1%
- Loss of Control on Ground: 1%
- Windshear/Thunderstorm: 1%
- Fire - Non-Impact: 1%

Excludes cases without event data
Loss of Control In-Flight, 2008-2017

Number of Fatal Accidents

- Personal Flying: 813
- Instructional Flying: 89
- Business Flying: 27
- Corporate Flying: 6
GA LOC Accidents

Fatal Accidents: 42%

* 2017 Preliminary numbers
GA LOC: Where It Happens

Fatal GA Loss of Control Accidents by Broad Phase of Flight, 2008-2017

- Takeoff: 7%
- Initial Climb: 17%
- Enroute: 14%
- Descent: 2%
- Maneuvering: 35%
- Approach: 24%
- Landing: 2%
- Unknown/Other: 1%

Excludes cases without event data
Airport-Related GA LOC

Fatal GA Loss of Control Accidents 2008-2017

- VFR Downwind – 2%
- VFR Base – 3%
- VFR Crosswind – 1%
- VFR/IFR Approach 4%
- Final – 7%
- Missed Approach/Go Around – 6%
- Takeoff – 7%
- Initial Climb – 17%
### Worldwide Commercial Jets

#### Fatalities by CICTT Aviation Occurrence Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Fatalities (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC-I</td>
<td>1,498</td>
</tr>
<tr>
<td>LOC (Landing)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Takeoff)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Ground Handling)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Runway Excursion)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Runway Incursion)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (System/Component Failure)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Undetermined)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Overshoot)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Wind Shear)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Other)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (F-NI)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (Other)</td>
<td>0</td>
</tr>
<tr>
<td>LOC (RAIAP)</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Total Fatal Accidents**: 65

**Note**: Principal categories as assigned by CAST

For a complete description of CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories, go to [www.inflaviationstandards.org](http://www.inflaviationstandards.org).

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**LOC**: 23% of Fatal Accidents
Steering Committee
Co-chairs – Mike O'Donnell (FAA/AVP)
Sean Elliott (EAA)
Government – FAA (AFS, AIR, ATO, AAM & ARP)
- NASA (Research),
- NTSB (Observer)
Industry – GAMA, EAA, NBAA, NATA,
SAFE, LAMA & Insurance

Safety Analysis Team
Co-chairs: Corey Stephens (FAA)
Jens Hennig (GAMA)
Members: FAA, AOPA, EAA, GAMA, UAA, MFGs,
FAAST, NAFI, Insurance, Academia, SAFE

Working Groups
(To include SMEs from various general aviation segments, depending on study)

GAJSC
Who We Are...
- Strategic guidance
- Management/Approval of Safety Plan
- Provide direction
- Membership Outreach
- Provides linkage to ASIAS

- Identify future areas of study/risk
- Charter safety studies
- Provide guidance and direction
- Draw data from various areas
- Develop a prioritized Safety Plan
- Develop metrics to measure effectiveness of safety solutions

- Data analyses
- Safety enhancement
- Mitigation development
Loss-Of-Control Working Group

Safety Enhancements Identified

- AOA – New, Current, Retrofit
- Aeronautical Decision Making
- Stabilized Approach
- Single Pilot CRM
- Medication effects
- Weather Technologies
- Etc...

28 Safety Enhancements
plus
8 more with second study
Lower Cost AOA Displays

- Stall occurs at a specific Angle-of-Attack
  - But not necessarily at the same airspeed

First of AOA indicators built to ASTM stds and installed as a minor mod

FAA policy changed on Non-Required Safety Equipment
LOC Roundtable – What, When, Where

NTSB MOST WANTED LIST
ROUND TABLE

PREVENT LOSS OF
CONTROL IN FLIGHT
IN GENERAL AVIATION
THROUGH TRAINING AND TECHNOLOGY

TUESDAY, APRIL 24, 2018 // 0830–1500 // WASHINGTON, DC // NTSB BOARDROOM & CONFERENCE CENTER
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0830–0845</td>
<td><strong>WELCOME/OPENING</strong> • Robert L. Sumwalt, NTSB Chairman</td>
<td></td>
</tr>
<tr>
<td>0845–0900</td>
<td><strong>INTRODUCTION:</strong> <em>Data &amp; Accidents</em> • John DeLisi, Director, NTSB Office of Aviation Safety</td>
<td></td>
</tr>
<tr>
<td>0900–1100</td>
<td><strong>TOPIC 1:</strong> <em>Pilot Training/Education</em></td>
<td></td>
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<tr>
<td>1100–1200</td>
<td><strong>LUNCH</strong> • On your own (Promenade Level)</td>
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<tr>
<td>1200–1215</td>
<td><strong>SPECIAL PRESENTATION:</strong> <em>Remora Systems, EAA Founder’s Innovation Prize Winner</em></td>
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<tr>
<td>1215–1400</td>
<td><strong>TOPIC 2:</strong> <em>Cockpit Technology</em></td>
<td></td>
</tr>
<tr>
<td>1400–1415</td>
<td><strong>BREAK</strong></td>
<td></td>
</tr>
<tr>
<td>1415–1450</td>
<td><strong>TOPIC 3:</strong> <em>Challenges &amp; Next Steps</em></td>
<td></td>
</tr>
<tr>
<td>1450–1500</td>
<td><strong>CLOSING</strong> • Robert L. Sumwalt, NTSB Chairman</td>
<td></td>
</tr>
</tbody>
</table>
Organizations At The Table

Industry & Government Roundtable Participants

Aircraft Owners & Pilots Association | Justin Barkowski, Director of Gov’t/Regulatory Affairs
AOPA Air Safety Institute | Paul Deres, Director of Education
Experimental Aircraft Association | Sean Elliott, Vice President of Advocacy & Safety
Embry-Riddle Aeronautical University | Carolina Anderson, Associate Professor of Aeronautics
Federal Aviation Administration | Mel Johnson, Policy & Innovation Division; Brad Palmer,
                                General Aviation & Commercial Division; Dave Sizoo, Small Airplane Standards Staff;
                                Corey Stephens, Accident Investigation & Prevention
ForeFlight | Tyson Weihs, Co-Founder and CEO
General Aviation Manufacturers Association | Jens Hennig, VP of Operations
Liberty University School of Aeronautics | Andrew Walton, Director of Safety
Mindstar Aviation | Stasi Poulos, President and CEO
NTSB | The Honorable Earl Weener, Board Member; Timothy LeBaron, Deputy Director
      for Regional Operations; Mike Folkerts, Air Safety Investigator
Orbital ATK Flight Systems | Charlie Precourt, VP & General Manager
Patty Wagstaff Aviation Safety | Patty Wagstaff, General Manager
Society of Aviation & Flight Educators | Doug Stewart, Founding & Charter Member
“Human beings, who are almost unique in having the ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.”
Safety Management System

- Safety Policy
- Safety Risk Management
- Safety Assurance
- Safety Promotion
Changes to Safety Culture

Reactive & Forensic

• Whack-a-mole management
• Crisis safety management
• Silos of knowledge
• Data is collected

Risk-based & Predictive

• Risk management
• Change management
• Data analysis and information sharing
• Data answers questions
Changes to Safety Culture

Reactive & Forensic

• “Off with their heads”
• Safety organization responsible for safety
• Regulator is dictatorial and despised
• Safety expected by regulations

Risk-based & Predictive

• Just culture
• Everyone responsible for safety
• Regulator is collaborative and respected
• Safety enhanced via voluntary initiatives