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# Keynote Speech

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# Pilot Training Issues Identified in Accident Investigations


Christopher A. Hart
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# Outline

- NTSB Basics
- Some Pilot Training Issues
  - Part 121
  - General Aviation

# NTSB 101

- Independent federal agency, investigate transportation mishaps, all modes
- Determine probable cause(s) and make recommendations to prevent recurrences
- Primary product: Safety recommendations
  - Favorable response > 80%
- *SINGLE FOCUS IS SAFETY*
- Independence
  - Political: Findings and recommendations based upon evidence rather than politics
  - Functional: No “dog in the fight”

# Part 121 Pilot Training Issues

- What to add, what to drop, in the limited training agenda
- Automation
- CRM
- Training for rare events
- How many failures is too many?

# Pilot Training Curriculum

- Training time is limited
- Accidents and incidents often reveal need for additional types of training
- Recent examples (from Air France 447) include
  - Response to loss of airspeed information in cruise
  - Manual flight at cruise altitude
  - Recognition of, avoidance of, and recovery from aerodynamic stall at cruise altitude
- What to drop when new types of training are added?

# Automation Training Issues

- Objectives:
  - Optimize the effectiveness of the automation
  - Maximize likelihood of successful outcome if something goes wrong
- Most effective way to train:
  - By rote, e.g., you do “x,” and the system will do “y”?
  - To understand system architecture and concept?
- How to optimize use of automation without causing a loss of basic piloting skills?
- How to ensure that increasing automation will not undermine professionalism?

# Air France 447, Rio to Paris, 2009

- The Conditions
  - Cruise, autopilot engaged
  - Night, in clouds, turbulence, near thunderstorms, coffin corner
  - Ice blocked pitot tubes, thus no airspeed information

  - Autopilot and autothrottle became inoperative upon losing airspeed information
  - Protections against aerodynamic stall disabled without airspeed information
  - Pilots responded inappropriately, caused aerodynamic stall
  - Crashed into the ocean, fatal to all 228 on board
- Queries:
  - Pilot training re loss of airspeed information in cruise?
  - Importance of CRM – pilot knowing other pilot's actions?
  - Pilot training re manual flight at cruise altitude?

# Asiana 214 Landing at SFO, 2013

- The Conditions
  - Landing SFO Rwy 28L,  >11,000 feet
  - VFR, negligible wind, 1128 PDT
  - ILS glide slope transmitter inoperative
  - Attempted manual landing
  - Unaware that autothrottle was not maintaining speed
  - Became low and slow, go-around attempted too late, struck seawall
  - 3 fatalities
- Queries:
  - Pilots adequately trained about system?
  - Inadequate warning re loss of automatic speed control?
  - Inadequate CRM?
  - Inadequate maintenance of manual skills?

# CRM Training

- Significant progress since implementation
- "Soft" skill
  - More difficult to convince pilots that it's important
  - More difficult to measure progress
- Frequent problem in accidents: Failure by pilots to communicate with each other
- Recent examples
  - UPS 1354, approach to Birmingham, 2013
  - Air France 447, Rio de Janeiro to Paris, 2009
  - Colgan 3407, approach to Buffalo, 2009

# Training for Rare Events

- Training time limited, generally less training for less frequent events
- In deciding appropriate level of training for rare events, important to consider potential severity
- Examples
  - V1 engine cuts:  Many pilots never have an engine failure on takeoff in their entire career, but likelihood that actual failure could be catastrophic is high
  - Loss of airspeed information in cruise
  - Loss of autopilot, necessitating manual flight, in cruise
  - Aerodynamic stall, near ground or in cruise

# Training Failures

- How many failures are allowed?
- Example:  Colgan crash at Buffalo
  - Captain failed first attempt at
    - FAA Commercial check ride
    - FAA Instrument check ride
    - FAA Multi-engine check ride
  - Also failed two airline currency rides
  - Pilot's response to stick shaker/pusher in accident flight was to pull (with 95 lbs of force)

# General Aviation Training Challenges

- Basic “required” cycle is only every two years
- Tremendous variability in
  - Student situations
  - Student abilities
  - Missions to be trained for
  - Training curricula
  - Instructor capabilities

# Tall Pole in the GA Tent

- Loss of control in flight (fixed-wing)
- Typically involves aerodynamic stall
  - Straight stall
  - Accelerated (more than 1 g) stall
  - Takeoff/climb stall (back side of the power curve)
  - Yaw stall (spin)
  - Skidded turn/cross-controlled stall
- Multi-engine aircraft
  - All of the above plus Vmc roll
- Solution:  Better training, aided by AOA indicator?
  - Improve instructor understanding of stall aerodynamics
  - Training re AOA indicator

# Other Than Stick and Rudder Skills

- Judgment:  Go, no-go decision, “get-home-itis”
  - Must consider pilot, airplane, and environment
- Single-pilot “CRM”:  Best use of available resources
- Impairment
  - Increasing presence of impairing drugs (OTC, prescription, and illegal) in GA fatal crashes
  - How to find out which drugs may cause impairment?
  - How to find out how soon to fly after taking those drugs?
- Fatigue
  - No requirements
  - Self-diagnosis is unreliable
  - Impairs both decision making and execution
- Personal electronic devices
  - Fatal accidents in every mode due to inappropriate use

# Generic Training Issue: Complacency

- Complacency: "A feeling of being satisfied with how things are and not wanting to try to make them better"
- However, safety is a never-ending journey that requires continuous improvement
- Common manifestation of complacency is lack of procedural compliance, e.g., failure to use checklist; hence, NTSB produced a safety video on procedural compliance
- Training challenge: How to train against human nature, to continue focusing on safety as adverse events become more rare???
- Recent example: Bedford, MA, 2014

# G-IV Takeoff From Bedford, 2014

- Pilots almost always flew together in the same airplane
- Combined total time almost 30,000 hours, excellent training, unblemished records
- Before Starting Engines checklist: Disengage gust lock – not done
- After Starting Engines checklist: Controls free and correct – not done
- Pilots did not do “Controls free and correct” in 173 of previous 175 takeoffs
- Not deterred by yaw damper limiting light, inability to move throttles to target take-off EPR, inability to rotate
- Waited too long to abort, overrun fatal to all 7 on board

# Conclusions

- Most aircraft will have human pilots for the foreseeable future
- Aviation safety will always ultimately depend upon adequate initial and recurrent training of those pilots
- Training challenges are evolving as systems become more complicated and automated
- Training challenges are increasing as operations become safer

# Thank You

***Questions?***