



Christopher A. Hart
Acting Chairman

Outline

- NTSB Basics
- Some Future Concerns



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”



Some Future Concerns

- Pilot professionalism
- Overzealous criminalization of accidents
- Increasing automation



Pilot Professionalism

Problem

- Loss of military pilot pipeline
- Military: “Right Stuff” or out

Current Civilian System

- Written test: Knowledge
- Flying test: Skills and knowledge
- *Not tested: Judgment or professionalism*
- *No limit on how many times to take tests*



Abundant Professionalism

- Hudson River landing (2009)
- Gliding to the Azores (2001)
- Sioux City (1989)
- Gimli Glider (1983)



Lack of Professionalism

- Let's try FL 410 (2004)
- Takeoff without runway lights (2006)
- Stick shaker: PULL! (2009)
- Minneapolis over-flight (2009)

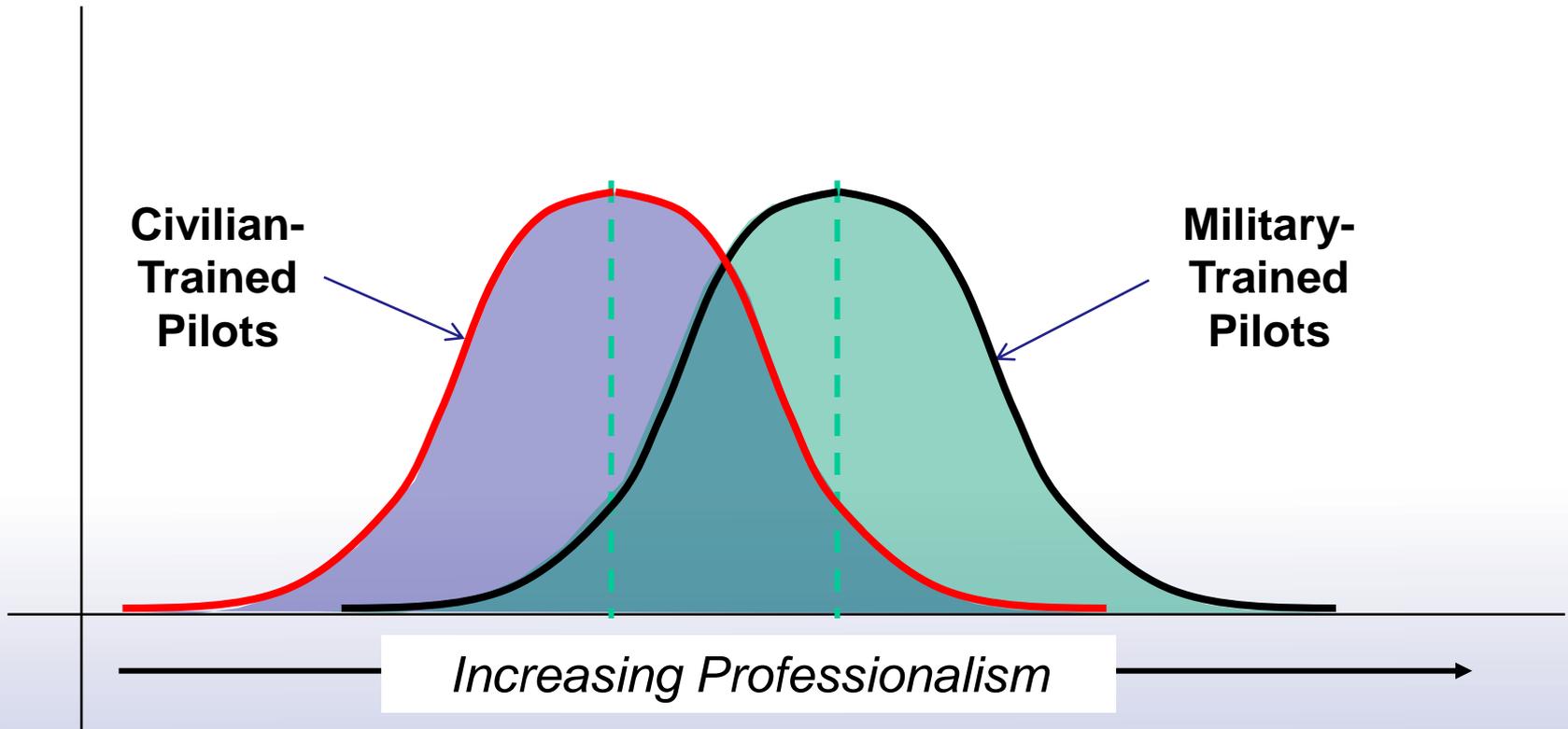


The Training Challenge

- Initial training must:
 - Develop knowledge and skills
 - Be evaluated by more than just (eventually) passing knowledge and skill tests
 - Also develop and instill good judgment and professionalism
- Recurrent training must:
 - Continue to develop and strengthen all of the above



Need to Shift the Bell Curve



Overzealous Criminalization

- Systems are getting more complex
- Most accidents involve good people trying to do the right thing under sometimes difficult circumstances
- Human error: Immediate response is to ***PUNISH!***
- Issue: Best way to stop error that is *inadvertent?*



Undesirable Results

Possibility of criminalization:

- Chills willingness of front-line employees to participate in proactive information programs
- Hinders mishap investigations
- Reduces likelihood of investigating or addressing system issues



Recent Examples

- Concorde, Paris, France (2000)
- GOL 1907, Brazil (2006)
- Asiana 214, San Francisco (2013)?



Concorde

– Chain of Events

- Takeoff
- Piece of metal on runway from previous airplane
- Main gear tire shredded after hitting piece of metal
- Fragments from tire hit wing, punctured fuel tank
- Leaking fuel caught fire



GOL 1907

– Chain of Events

- Aircraft eastbound, FL 370, per international convention
- Assigned route turned westbound at navigation waypoint
- Go to even thousand (FL 380 or 360)?
- Pilots tried unsuccessfully to contact controllers, so remained at FL 370
- Transponder on “Standby” (for long time), hence
 - Airplane invisible to ATC
 - Airplane also invisible to TCAS in other airplanes
- Both airplanes navigating with GPS



– Theory

- Pilot’s foot on footrest hit transponder “Standby” button



Increasing Automation

- When it *malfunctions*:
 - Increasing complexity increases likelihood that operators will not completely understand the system
 - Increasing reliability increases likelihood that operators have never seen a given malfunction before, even in training
- When it's working *properly*:
 - Adverse impact on professionalism?



Examples

- Strasbourg, France (1992)
 - Cali, Colombia (1995)
- Amsterdam, Holland (2009)
 - Rio to Paris (2009)
- San Francisco (2013)?



Strasbourg, France

– Risk Factors

- Night, mountainous terrain
- No ground radar
- No ground-based glideslope guidance
- No airborne terrain alerting equipment



– Very Sophisticated Autopilot

– Autopilot Mode Ambiguity



Human Factors Challenge

- “3.2” in the window, *with a decimal*, means:
 - Descend at a 3.2 degree angle (about 700 fpm at 140 knots)
- “32” in the window, *without a decimal*, means:
 - Descend at 3200 fpm

***Clue: Quick Changes in Autopilot Mode
Frequently Signal a Problem***

***Flight data recorder readout program could have
helped safety experts identify this problem***



Cali, Colombia

– Risk Factors

- Night
- Airport in deep valley
- No ground radar
- Airborne terrain alerting limited to “look-down”
- Last minute change in approach
 - More rapid descent (throttles idle, spoilers)
 - Hurried reprogramming

– Navigation Radio Ambiguity

– Spoilers Do Not Retract With Power



Recommended Remedies:

- Operational
 - *Caution re last minute changes to the approach!!*
- Aircraft/Avionics
 - Enhanced ground proximity warning system
 - Spoilers that retract with max power
 - Require confirmation of non-obvious changes
 - Unused or passed waypoints remain in view
- Infrastructure
 - Three-letter navigational radio identifiers
 - Ground-based radar
 - Improved reporting of, and acting upon, safety issues

*Note: All but **one** of these eight remedies address **system** issues*



Amsterdam, Holland

– The Conditions

- Malfunctioning left radar altimeter
- Pilots selected right side autopilot
- Aircraft vectored above glideslope
- Autothrust commanded throttles to idle
- Unknown to pilots, right autopilot using left radar altimeter
- Pilot unsuccessfully attempted go-around



– Queries:

- Should autopilot default to same side altimeter?
- More clarity re source of information? Ability to select?



Rio to Paris

– The Conditions

- Cruise, autopilot engaged
- Night, in clouds, turbulence, coffin corner
- Ice blocked pitot tubes
- Autopilot and autothrust inoperative without airspeed
- Alpha protections disabled
- Pilots' responses inappropriate



– 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?



Undercutting Professionalism?

- Washington Metro: Automation
 - Starts the train out of the station
 - Observes speed limits, avoids collisions
 - Stops the train in the next station
 - Opens the doors
- Operator
 - Closes the doors
- Issues
 - Work for pay, rather than for job well done?
 - Job satisfaction/professionalism?



Conclusion

In order to continue improving safety, the industry must address issues of professionalism, overzealous criminalization, and increasing automation



Thank You

Questions?



National Transportation Safety Board