NTSB National Transportation Safety Board

The View From the Investigators: Aviation Safety Issues

Presentation to: Lawyer-Pilots Bar Association

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Outline

- **NTSB Basics**
- **Some General Aviation Issues**
- **Some Commercial Aviation Issues**

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"**

Appellate Function

- **FAA license suspension/revocation proceedings are heard first by administrative law judge**
- **Appeals heard by the full Board**
- **Changes from Pilot's Bill of Rights II?**

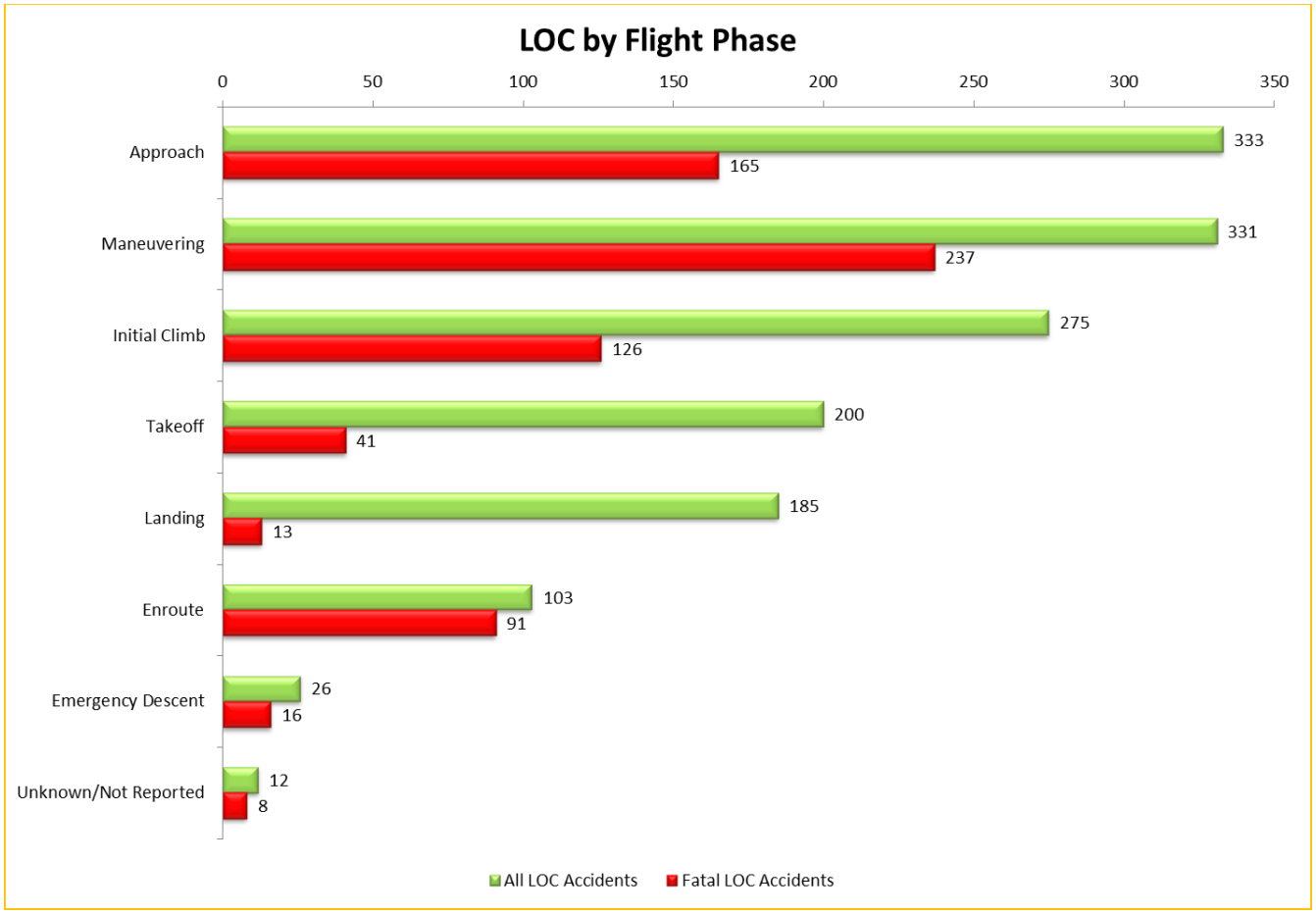
Two General Aviation Issues

- **Loss of Control**
  - **Taken from slides presented at 2015 Sun & Fun by Paul Cox, Senior Air Safety Investigator, Eastern Region**
- **Runway Accidents**
  - **Taken from slides prepared by Dan Bartlett, ATC Transportation Safety Specialist**

Loss of Control Accidents

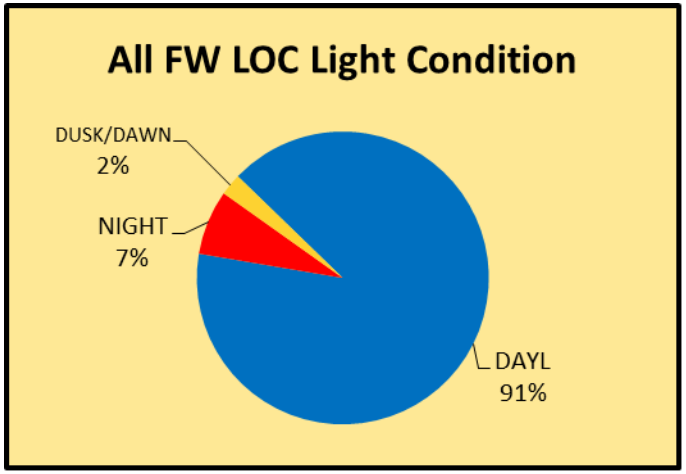
- Largest single cause (>40%) of GA fatal accidents
- General Aviation Joint Steering Committee (GAJSC) formed a Loss of Control Work Group
- On NTSB 2015 Most Wanted List
- Not defined in FARs, AIM, Pilot Handbook of Aeronautical Knowledge
- But we know it when we see it

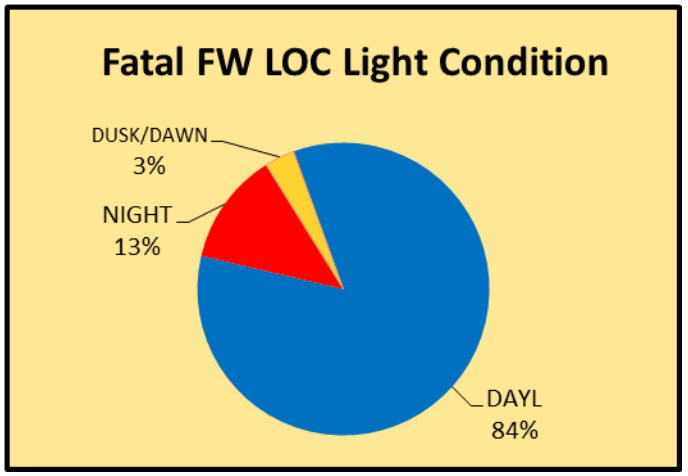
LOC Accidents: Phase of Flight

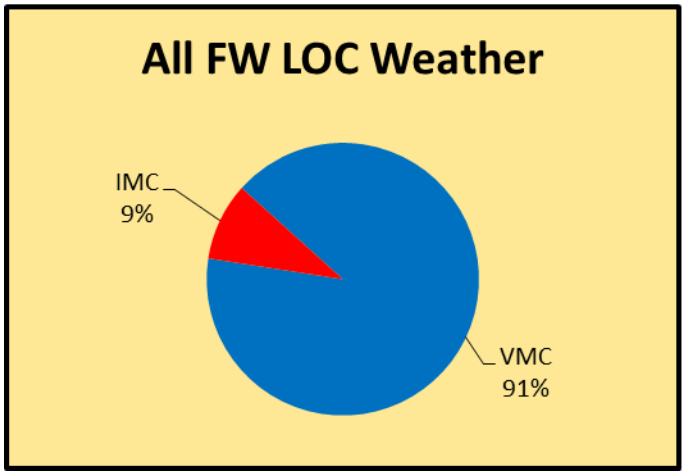


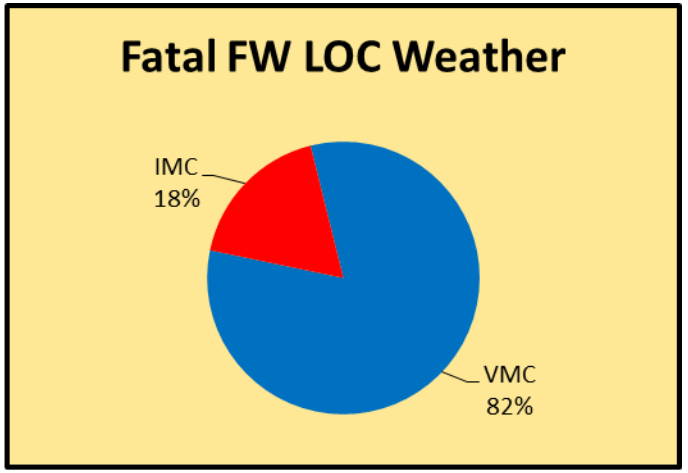
2008-2014

LOC Accidents: Time of Day, Weather









What's Happening in LOC Accidents?

- **All aircraft: Typically some type of aerodynamic stall**
  - **Straight stall**
  - **Accelerated stall**
    - **More than 1 g**
  - **Takeoff/climb stall**
    - **Back side of the power curve**
  - **Yaw stall (spin)**
  - **Skidded turn/cross-controlled stall**
  - ***Solution: AOA indicator?***
- **Multi-engine aircraft**
  - **All of the above plus Vmc roll**

Case Study: Kitfox, April 14, 2013

- **Probable Cause: Pilot's failure to maintain adequate airspeed during the turn to final, which resulted in an exceedance of wing critical angle-of-attack and a subsequent aerodynamic stall**
- **Contributing: Pilot's combined use of two sedating antihistimines, which resulted in his impairment**

Takeoff/Climb Stall:
Cessna 177B, May 5, 2012

- **Probable Cause: Pilot pitching the airplane to an excessive nose-up attitude during an aborted landing, which resulted in increased induced drag, diminished airspeed, and an aerodynamic stall/spin**
- **Contributing: Pilot's use of a sedating antihistamine, which resulted in impaired mental and motor skills**

Vmc Roll: Cessna 441, December 22, 2012

- **Probable Cause: Pilot's failure to maintain minimum control airspeed after a loss of power to the right engine which resulted in an uncontrollable roll into an inadvertent stall/spin**
- **Contributing: Failure of the right engine for undetermined reasons and the pilot's subsequent turn toward inoperative engine while maintaining altitude**

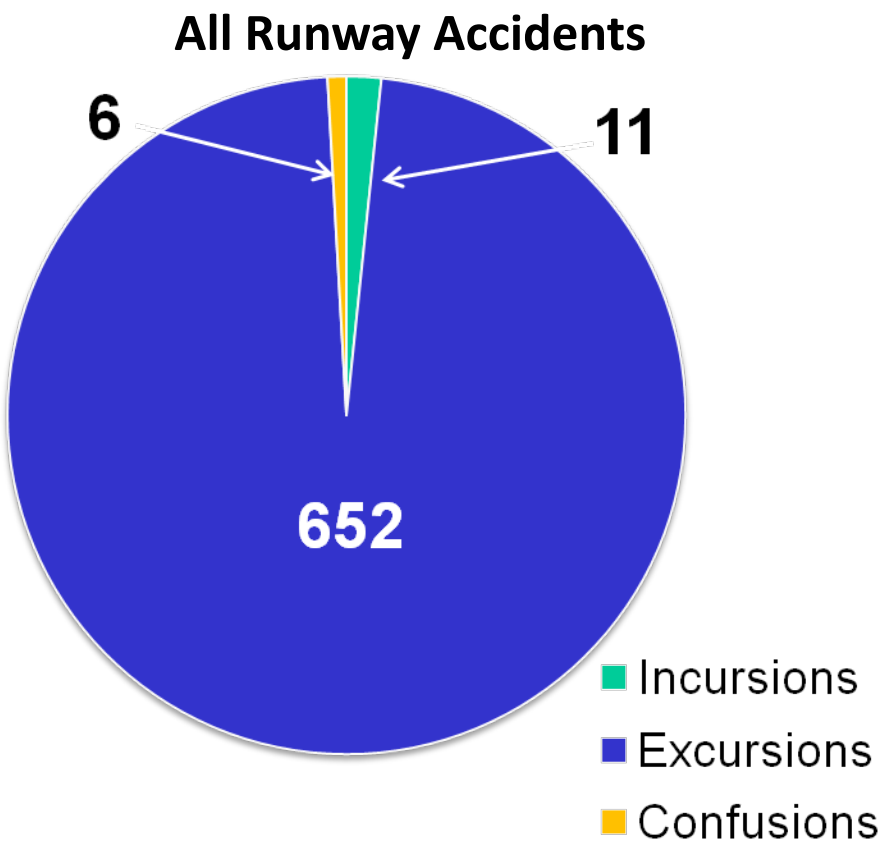
Runway Accidents: Definitions

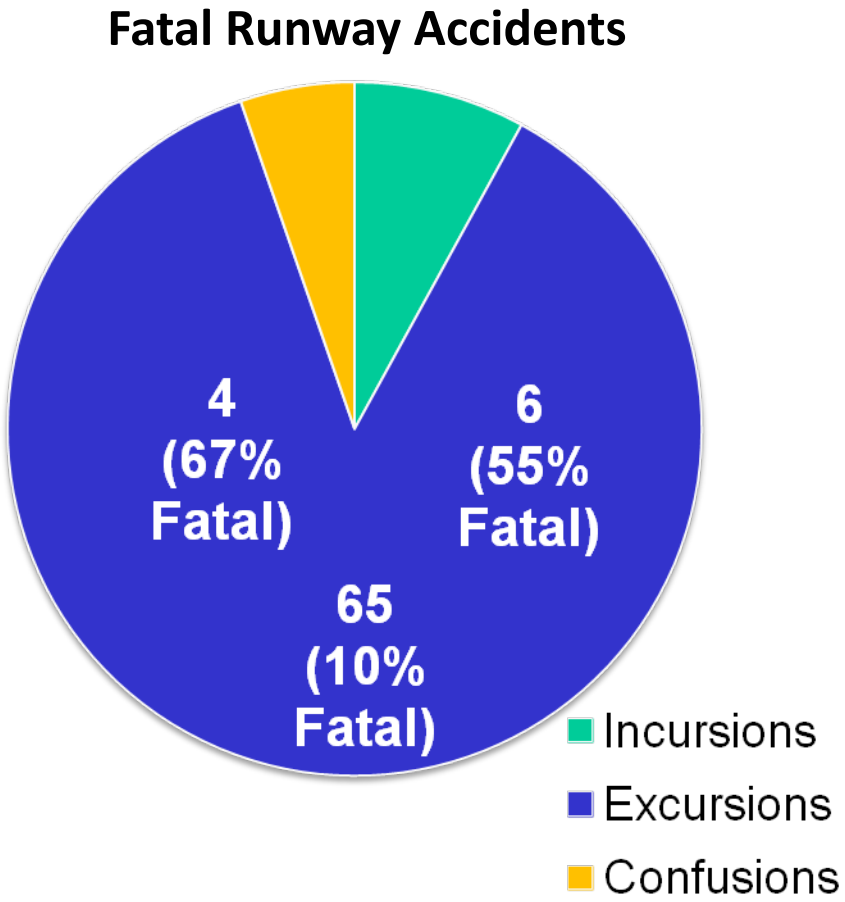
- **Incursion**
  - **Previously defined by FAA as *hazard created by* airplane or vehicle on the runway when it should not have been**
  - **Now defined as "any occurrence at an aerodrome involving incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing or takeoff aircraft" *whether or not a hazard was created***

Definitions, con't

- **Excursion**
  - **Includes takeoff overruns, landing overruns, and departing the runway laterally during takeoff or landing**
  - **Does not include landing short**
- **Confusion**
  - **Includes using other than dedicated or assigned surface for takeoff or landing, e.g., taxiway other than runway, or wrong runway**

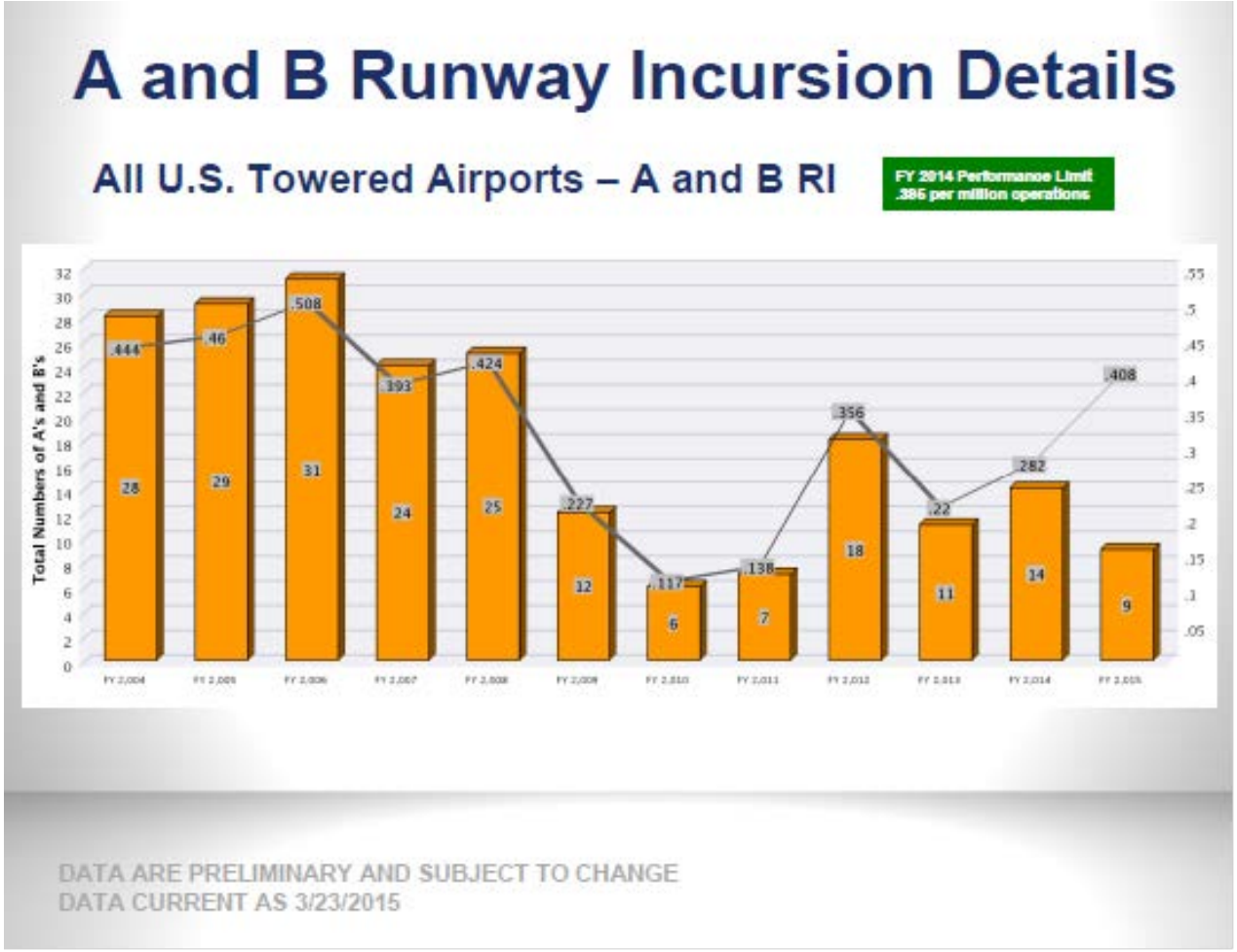
Runway Accidents, 1995-2010



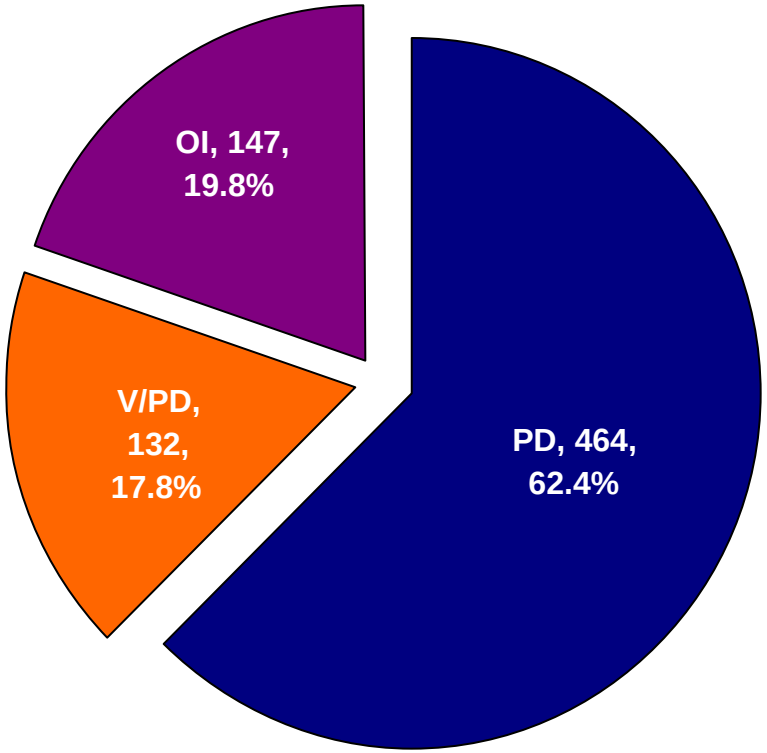


Note: Of 1429 accidents involving major or substantial damage from 1995-2008, 431 (30%) were runway related

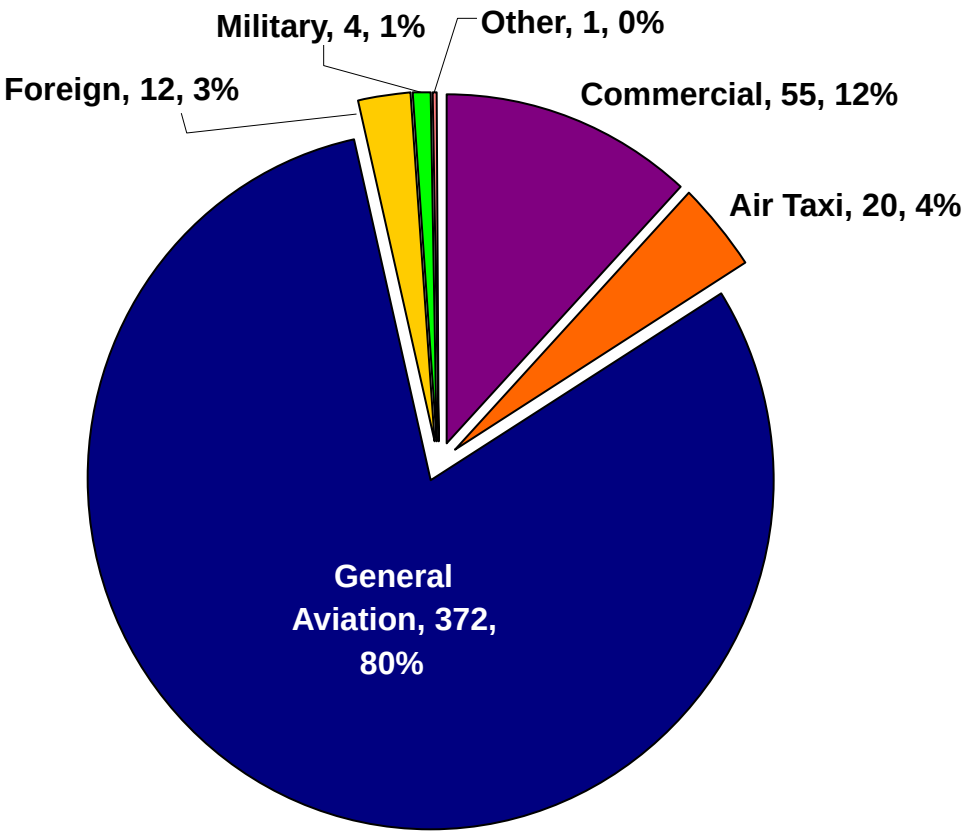
Runway Incursions – Bad News



Incursion Numbers



743 Runway Incursions



464 Pilot Deviations

Source: FAA, 1 Oct 2011 – 30 June 2012

What's Going Wrong?
Sometimes People Simply *FORGET!*

- **Nearly half of GA incursions involve entry onto the runway or across the hold short line**
  - **In nearly half of those, the pilot received a clearance, acknowledged the clearance, and read it back correctly**
  - **In the remainder, the pilot either received no clearance, or received a clearance to, but not onto, the runway**
- **Controllers sometimes forget and issue simultaneous (conflicting) clearances**

Other Error Sources: Abnormal Operations

- **Construction**
  - **Normal or construction lights may be inoperative**
  - **Routes may not be well marked**
  - **Procedures interim, may not be robust**
- **Other**
  - **Stuck mike – Causal link in takeoff without clearance**
  - **Long conversation – Resulted in landing without clearance**
  - **Mishap at airport – Resulted in incorrect clearance (procedures not robust or well-practiced)**

Result: New Paradigm

- Previous Response: Punishment
  - Mostly pilots
  - Sometimes controllers

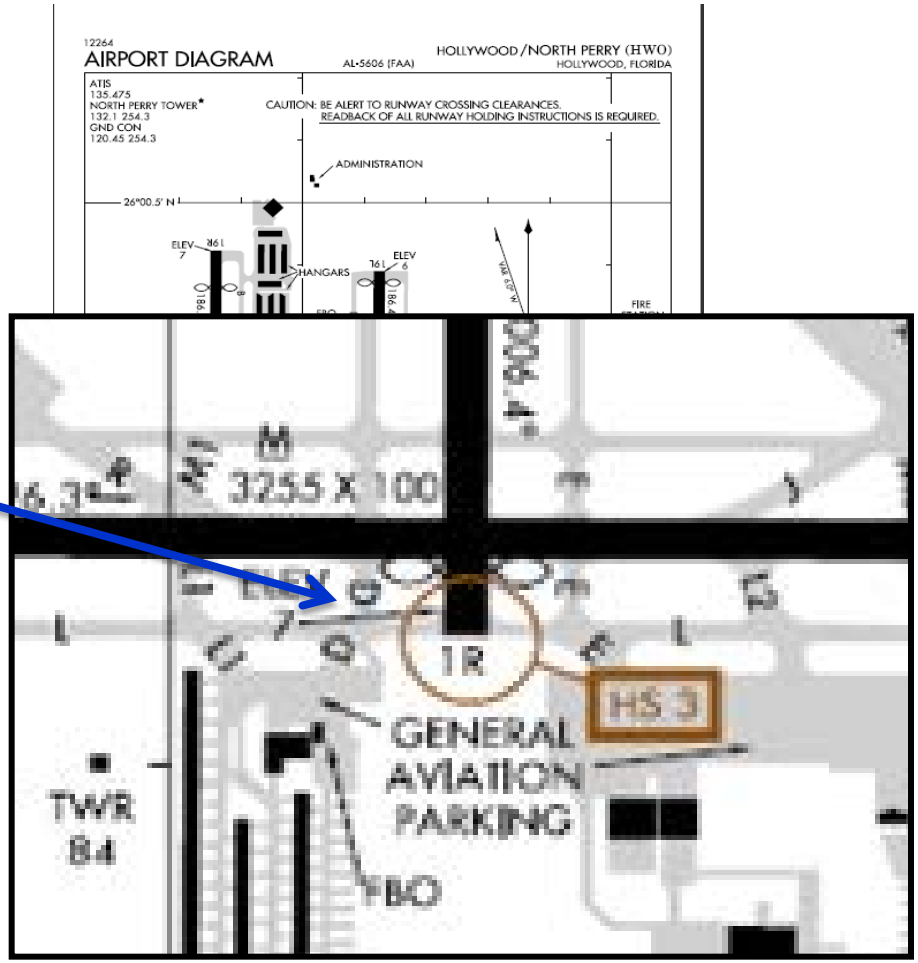
- The Good News: Runway Safety Council
  - Objective: Identify and fix problems, rather than punish
  - Collaborative activity, including FAA, airlines, labor, AOPA, and others
  - Quarterly meetings to determine root causes, re most recent RI's, make recommendations
  - Follow up on recommendations

Major Solution: Airport Chart

- **Have it**
  - **Incursions sometimes due to pilots unfamiliar, no chart**
  - **Get charts online**
  - **Encourage FBOs to provide charts**
- **Understand it (especially “Hot Spots”)**
  - **Incursions due to missed turn while programming FMS**
  - **Incursions due to failure to clarify confusing clearance**
  - **Incursions due to unawareness of “gotcha”**
  - **Wrong runway due to inadequate awareness of geometry**

Unawareness of “Gotcha”

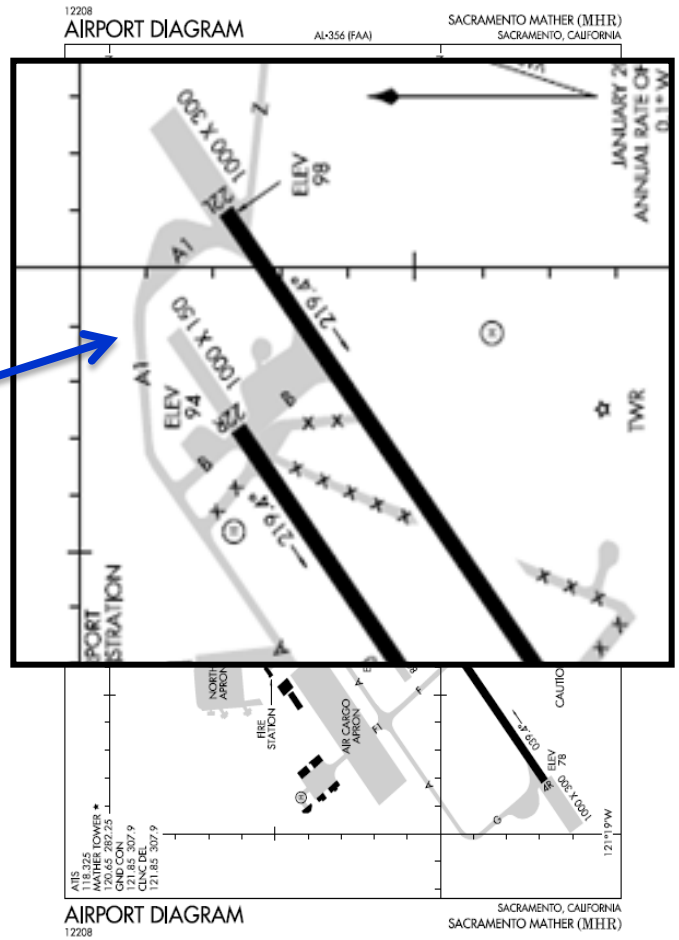
Note entry onto runway immediately after right turn out of FBO ramp



No Readback; Wrong Runway

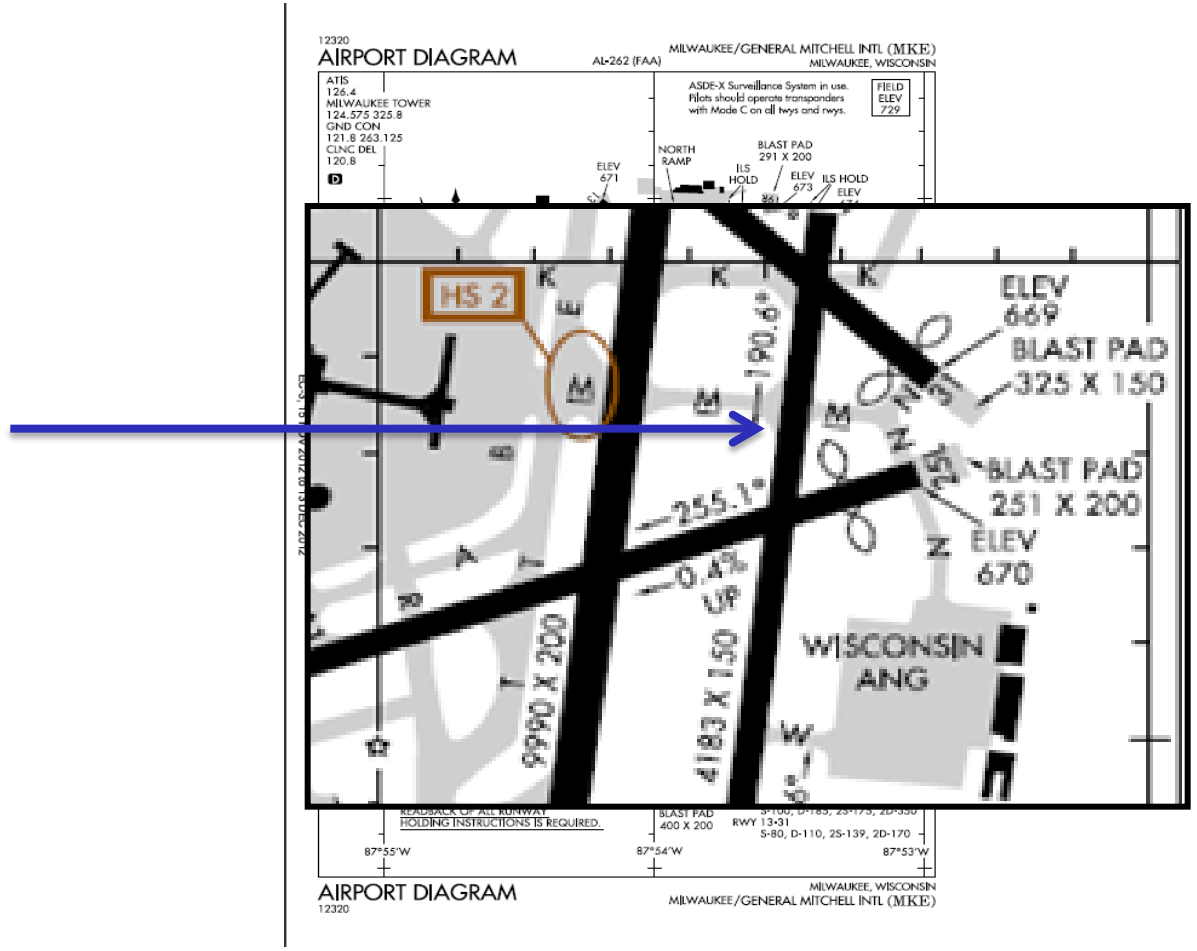
Note that

- ***Taxiway A does not go to RW 22R; must turn right onto Taxiway B***
- ***Taxiway A becomes Taxiway A1, but change not obvious***
- ***Taxiway A1 goes to RW 22L***



Non-Existent Intersection

Note that Taxiway M does not intersect RW 25L



Lessons Learned

- **Many airport safety issues examples involve**
  - ***At least one error by a pilot, and***
  - ***At least one error by a controller***
- **The system involves many good people trying to do the right thing, but pilots and controllers must always be alert for errors: *their own and others***
- **Pilots and controllers: *Trust but verify***
- **Pilots: Always use the taxi chart; and when in doubt, *ASK!!***

Recently Announced

- **FAA Runway Incursion Mitigation (RIM) Program**
  - **FAA developed a preliminary inventory of airport locations where runway incursions have occurred**
  - **Identified specific airport areas with risk factors that could contribute to a runway incursion, and identified those risk factors**
  - **Plan to work with airports to develop strategies to mitigate runway incursions at these locations**

Paradigm Shift

Identifying problems

and fixing them

improves safety

far more effectively

than punishment

Some Commercial Aviation Concerns

- Pilot professionalism
- Overzealous criminalization of accidents
- Increasing automation

Pilot Professionalism

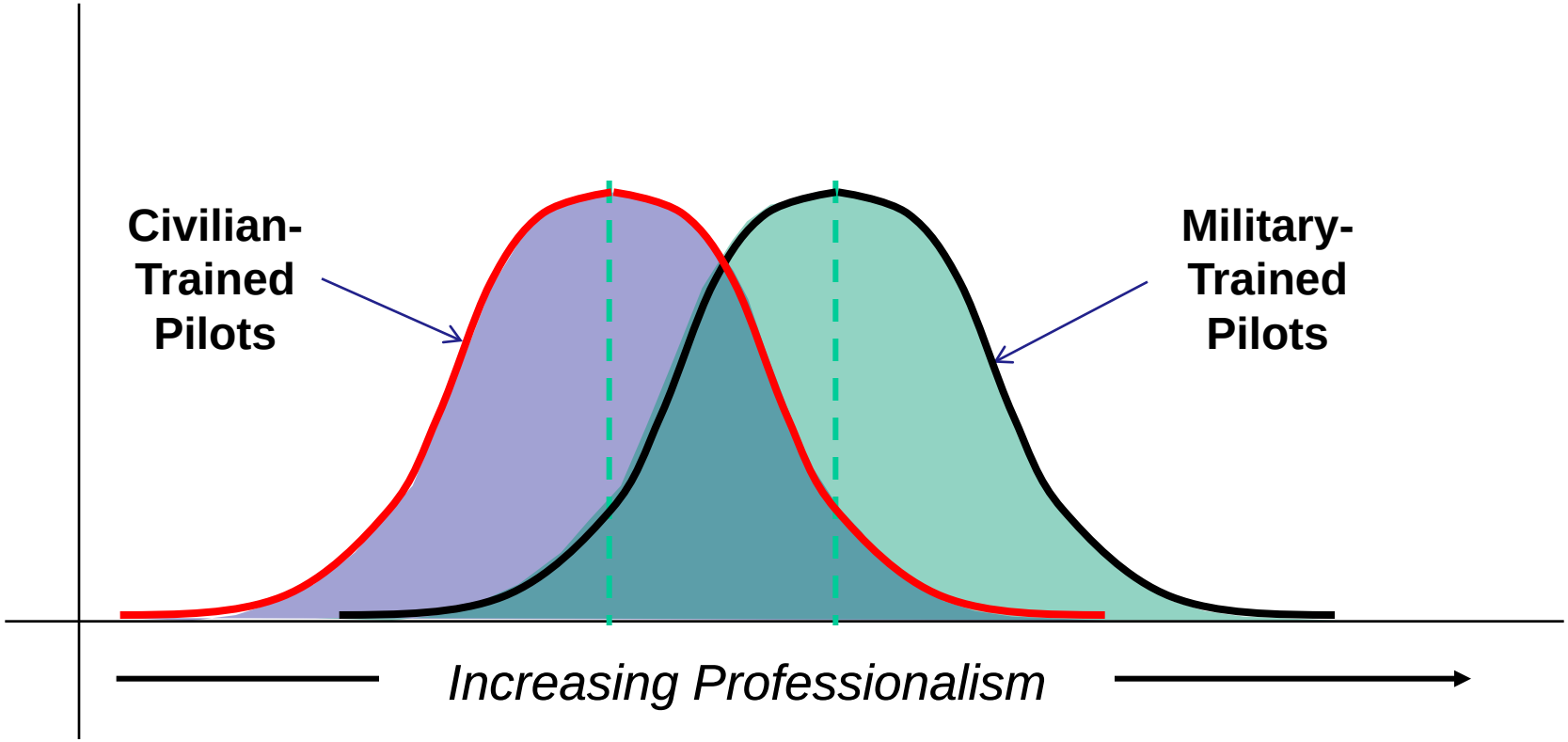
Problem

- **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***

Need to Shift the Bell Curve



Examples

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

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**

Examples

- **Concorde, Paris, France (2000)**
- **GOL 1907, Brazil (2006)**

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?

Recent Examples

- **Amsterdam, Holland (2009)**
- **Rio to Paris (2009)**

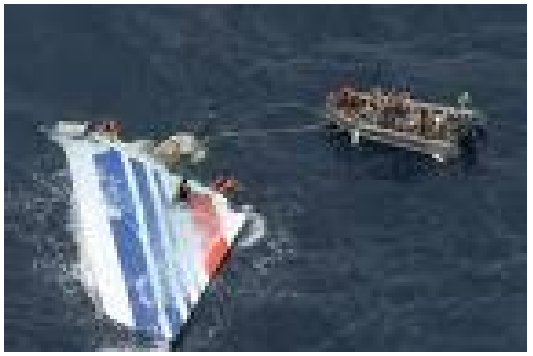
Amsterdam, Holland

- **The Conditions**
  - **Malfunctioning left radar altimeter**
  - **Pilots selected right side autopilot**
  - **Aircraft vectored above glideslope**
  - **Autothrust commanded throttles to idle, to go down and slow down**

  - **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 for pilots 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**
  - **Takes 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

Aviation safety is generally improving,

but safety is a continuing journey,

not a destination

Thank You!

Questions?