NTSB National Transportation Safety Board

Human Factors: It's not just all about humans, you know.

Robert L. Sumwalt

September 2, 2009

The Human

Organizational Influence

Regulatory Influence

LATENT CONDITIONS

ACTIVE FAILURES

The Human

Organizational Influence

Regulatory Influence

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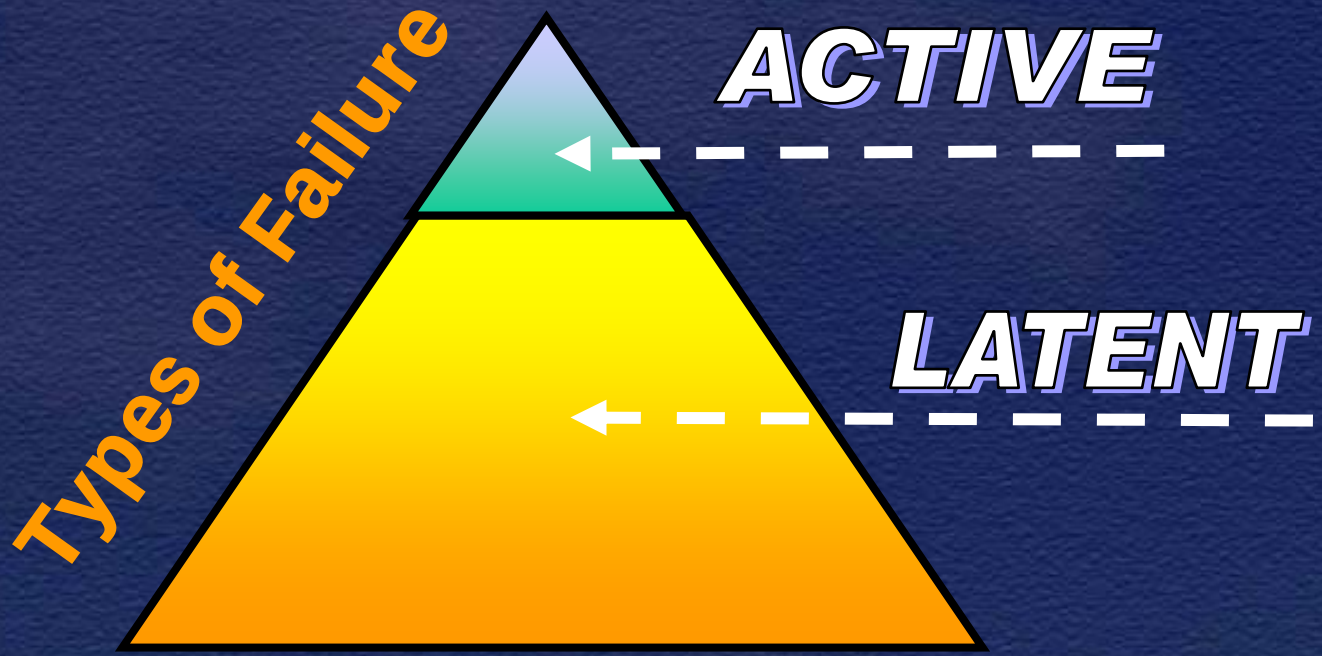
System Failures that Contribute to Accidents



Addressing latent conditions offers the greatest potential for safety improvements

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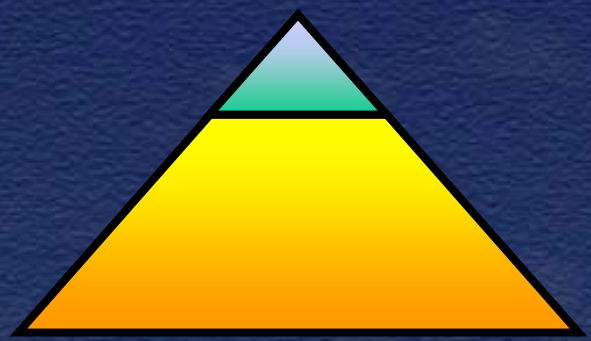
Continental Express, Eagle Lake, TX. 1991

NTSB Probable Cause

"… the failure of Continental Express maintenance and inspection personnel to adhere to proper maintenance and quality assurance procedures…"



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A Dissenting Viewpoint

- “Line management … has the regulatory responsibility for not only providing an adequate maintenance plan… but for implementing the provisions of that plan, as well.

- “By permitting, whether implicitly or explicitly, such deviations to occur on a continuing basis, senior management created a work environment in which a string of failures, such as [those that] occurred the night before the accident, became probable.”

- Honorable John K. Lauber

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John Lauber's proposed Probable Cause

1) the failure of Continental Express management to establish a corporate culture which encouraged and enforced adherence to approved maintenance and quality assurance procedures, and
2) the consequent string of failures by Continental Express maintenance and inspection personnel to follow approved procedures …

- Contributing to the accident:
  - the inadequate surveillance by the FAA of the Continental Express maintenance and quality assurance programs.

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Culture Defined

- Culture is a set of established beliefs, values, norms, attitudes and practices of an organization.

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Safety Culture

Doing the right things, even when no one is watching.

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Do you have a safety culture?

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Do you have a Safety Culture?

- "… it is worth pointing out that if you are convinced that your organization has a good safety culture, you are almost certainly mistaken."
- " … a safety culture is something that is striven for but rarely attained…"
- "…the process is more important than the product."

- James Reason, "Managing the Risks of Organizational Accidents."

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Roadmap to Safety Culture

1. Management Commitment and Emphasis
2. Standardization and Discipline
3. Training
4. Data Collection and Quality Assurance Programs

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Roadmap to Safety Culture

1. Management commitment and emphasis on safety
   - Safety begins at top of organization
   - Safety permeates the entire operation

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July 10, 2007, Sanford, FL

- Cessna 310 owned by NASCAR
- Flight planned Daytona Beach to Lakeland
- Inflight emergency, request for immediate diversion, crash
- 5 fatalities

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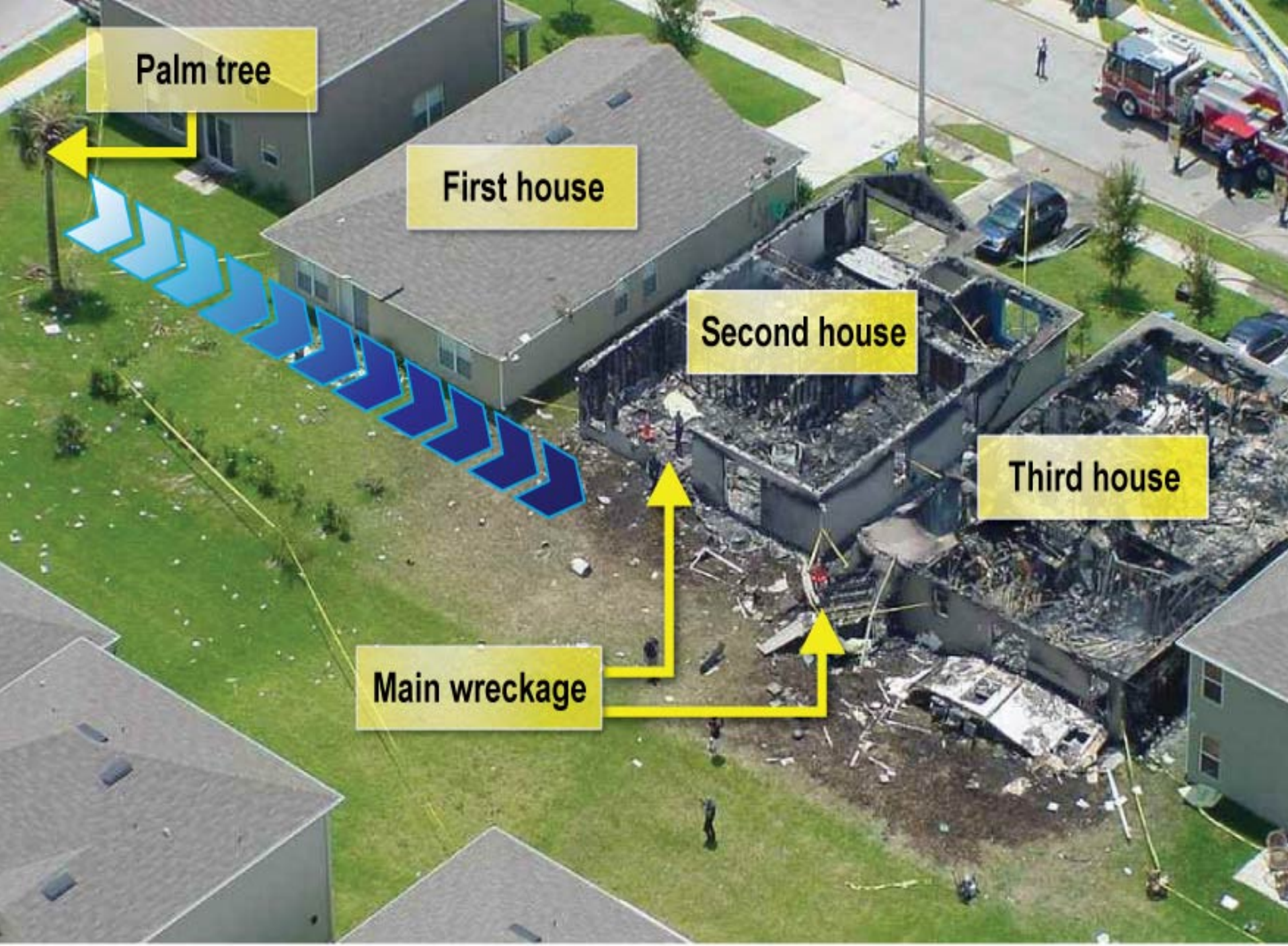
Palm tree
First house
Second house
Third house
Main wreckage

Declared Emergency

“Smoke in the cockpit.”

“Shutting off radios, elec.”

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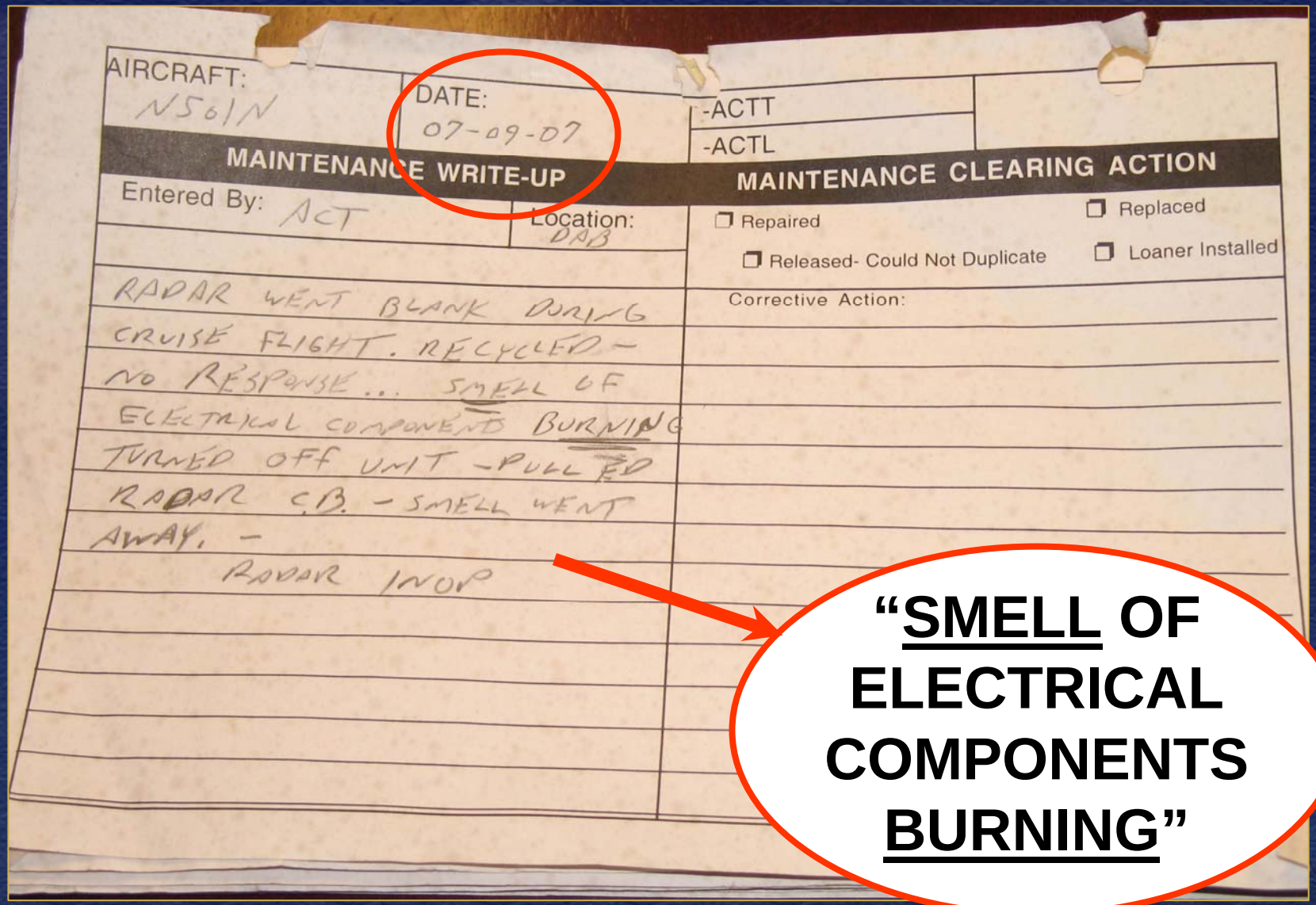
Maintenance Discrepancy Entry



Events - Previous Day

- That pilot followed company procedures
  - White original log sheet left in airplane binder
  - Handed yellow copy to DOM
  - Verbally informed technician
- Brief in-office discussion
- Airplane not inspected, modified, or grounded
- Airplane remained available for flight

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Active Failures

MECHANIC

- Did not inspect maintenance log or correct the discrepancy

PILOTS

- Dismissed radar issue as unimportant
  - accepted airplane “as is” and departed
- Likely reset weather radar circuit breaker for the flight

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Inadequate Organizational Processes and Procedures

- Maintenance forms not serialized, tracked, or retained
  - Yellow copy never provided
- SOP guidance versus reality
- No assurance discrepancies would be addressed
- No procedures for providing flight operations personnel (pilots and dispatchers) with airplane airworthiness information.

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Inadequate Procedures

- Most often a preflight fact sheet would be taped to airplane with highlighted items signed off by a mechanic
  - Not a requirement, not spelled out in SOP
- No guidance was provided to PIC for determining airworthiness of assigned aircraft

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Culture of Non-Compliance

- Aviation director could not readily locate SOP manual
- SOP manual viewed as a “training tool”
- Aircraft to only be used for company business
  - Accident flight was a personal flight
- PIC must possess ATP
  - PIC did not possess ATP
- Last 3 maintenance discrepancies had not been addressed

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Latent Conditions

- NASCAR enabled the accident by failing:
  - to have adequate processes and procedures to prevent such an event, and
  - to ensure compliance with the procedures they did have in place.

- “This accident started before the aircraft even left the ground.”

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Probable Cause

- "…actions and decisions by NASCAR's corporate aviation division's management and maintenance personnel to allow the accident airplane to be released for flight with a known and unresolved discrepancy, and;

- "The accident pilots' decision to operate the airplane with that known discrepancy, a discrepancy that likely resulted in an in-flight fire."

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Roadmap to Safety Culture

2. Standardization and Discipline
   - Management provides well thought-out policies and procedures
   - Stresses need for strict compliance with Standard Operating Procedures

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American Airlines

"American Airlines' maintenance personnel were using maintenance procedures that were not in accordance with written manuals and guidelines…"

"American Airlines' maintenance personnel repeatedly used an unapproved maintenance procedure…"

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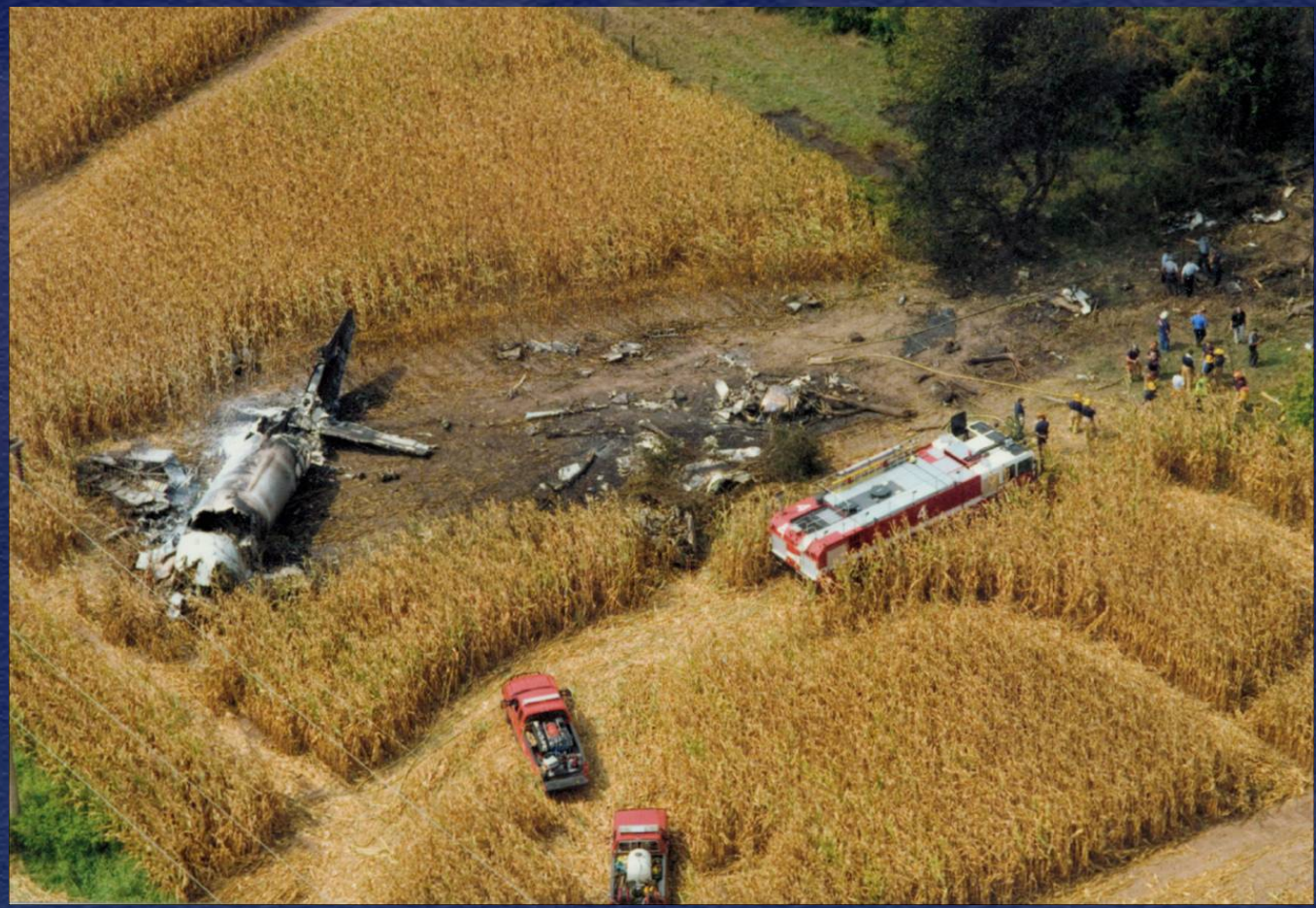
Air Tahoma Sept 1, 2008



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The Investigation Revealed…

- Elevator trim cables were rigged improperly, resulting in the trim cables being reversed.
  - When pilot applied nose-up trim, the elevator trim system actually applied nose-down trim.
- Inspector's block on maintenance work cards were not signed off by the Required Inspection Item (RII) inspector.

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59. Elevator System Rigging
a. Connect elevator cables and rig in accordance with Allison Convair M/M, section 8, figure 8.2.107.

Inspection:_____

AIR TAHOMA
CV 580 Overhaul

Card No.: 55-04
Date: 10/03/96
Rev: Original
Area: Horizontal Stabilizer and Elevator

A/C: N587
Date: 8-21-08
T.A.T.: 71965.4
STA.: LCK

	MECH L/H	MECH R/H
b. Connect elevator servo trim tab cables and rig in accordance with Allison Convair M/M, section 8, figure 8.2.108 and 8.2.108A. Inspection:_____	N/A [redacted]	[redacted]
c. Connect elevator gust lock and rig in accordance with Allison Convair M/M, section 8, figure 8.2.114. Inspection:_____	[redacted]	N/A [redacted]
d. Connect autopilot cables to elevator bell cranks. Rig I.A.W. with AIR TAHOMA INC. CV580 Maintenance Supplement 22-10-01. Inspection:_____	[redacted] N/A	
NOTE: A COMPLETE INSPECTION OF ALL ELEVATOR CONTROLS MUST BE ACCOMPLISHED AND SIGNED OFF BY AN RII QUALIFIED INSPECTOR AND A LOG BOOK ENTRY MADE TO THIS EFFECT. RII Inspector:_____	[redacted]	

Not signed by RII Inspector

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Roadmap to Safety Culture

3. Training
   - Strong commitment to training and provide oversight of their training
   - Ensure training standardization and discipline are maintained

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Air Midwest 5481 Jan 8, 2003

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Air Midwest 5481

- “Air Midwest did not have maintenance training policies and procedures in place to ensure that each of its maintenance stations had an effective on-the-job training program.”

- “Air Midwest did not ensure that its maintenance training was conducted and documented in accordance with the company’s maintenance training program, which degraded the quality of training and inspection activities at the Huntington, West Virginia, maintenance station.”

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Roadmap to Safety Culture

4. Data Collection and Quality Assurance Programs
   - data-driven risk management
   - safety audits
   - confidential incident reporting systems

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Data collection and analysis

- The organization collects and analyzes "the right kind of data" to keep it informed of the safety health of the organization

  – collects, analyzes
  and disseminates information
  on incidents and near-misses,
  as well as proactive safety checks.

- James Reason, Ph.D.

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Air Midwest 5481

- “Air Midwest’s Continuing Analysis and Surveillance System program was not being effectively implemented because it did not adequately identify deficiencies in the air carrier’s maintenance program, including some that were found by the Federal Aviation Administration before the flight 5481 accident.”

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American 1400

- “[American Airlines’] Continuing Analysis and Surveillance System program did not adequately detect and correct these performance deficiencies before they contributed to an accident.”

Data collection and analysis

- How do you detect and correct performance deficiencies before an accident?
- How do you keep your finger on the pulse of your operations?
- Do you have multiple data sources?

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Employees

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Are employees comfortable reporting?

- Employees are open to report safety problems, if they receive assurances that:
  - The information will be acted upon
  - Data are kept confidential or de-identified
  - They will not be punished or ridiculed for reporting
    - Non-reprisal policy signed by CEO

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Reporting culture is essential

- "There is growing realization in the aviation industry that encouraging prompt reporting of safety issues actually reduces the number of accidents and incidents.

- "An environment of 'open reporting' is a key element in fostering a 'just culture' for the systematic reporting, collection, analysis and dissemination of safety information that will be used solely to prevent accidents."

  – Flight Safety Foundation "Ramp Safety Operational Procedures – A template for ramp supervisors"

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“Just” Culture

- Employees realize they will be treated fairly
  - Not all errors and unsafe acts will be punished (if the error was unintentional)
  - Those who act recklessly or take deliberate and unjustifiable risks will be punished

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Just Culture

"An atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behavior."

- James Reason, Ph.D.

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