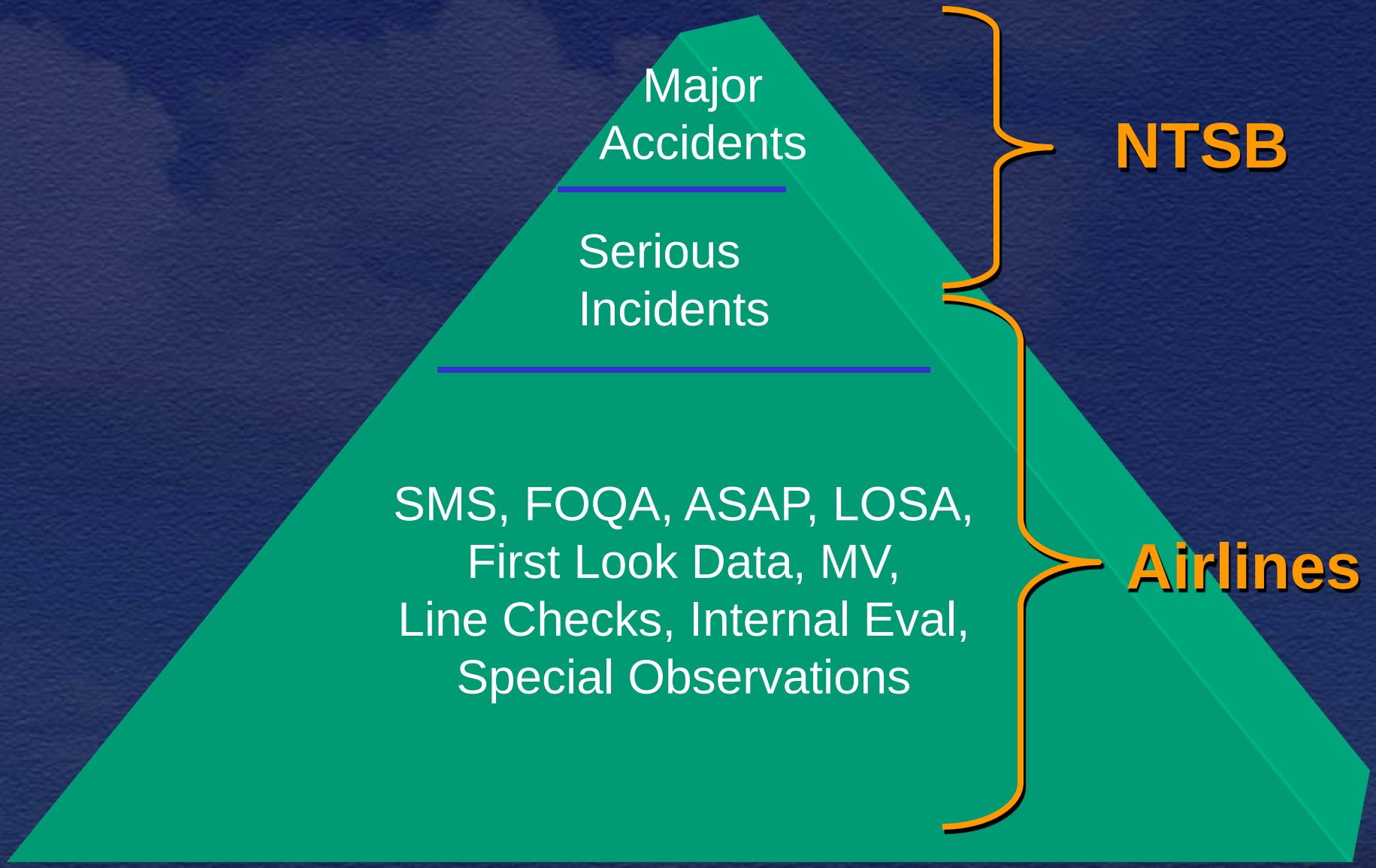
NTSB National Transportation Safety Board

# Inadequate Monitoring and Cross-checking

## The Problem that Never Went Away

Robert L. Sumwalt

# Primary Sources of Data



# From my perspective…


Monitoring and Cross-checking is still an area that needs improvement.

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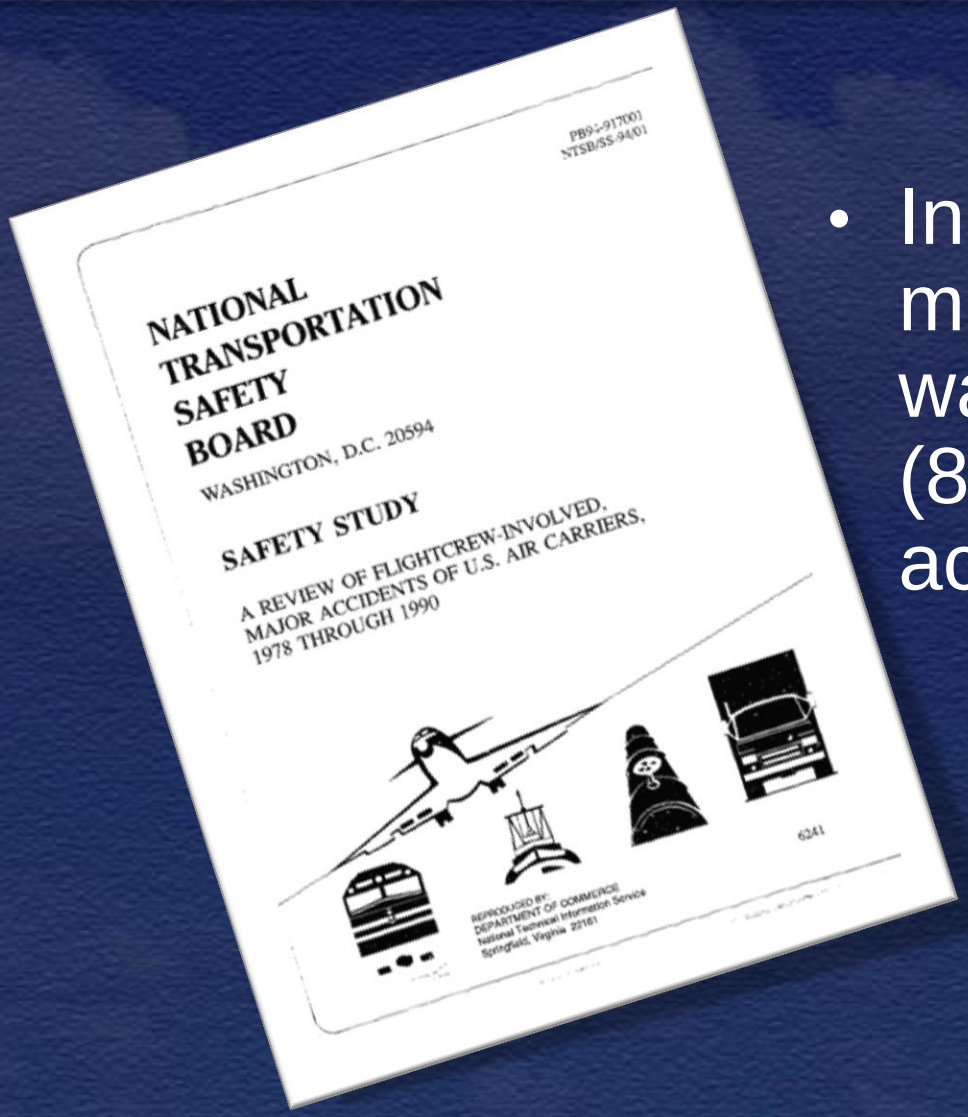


- Inadequate crew monitoring or challenging was a factor in 31 of 37 (84 percent) reviewed accidents.

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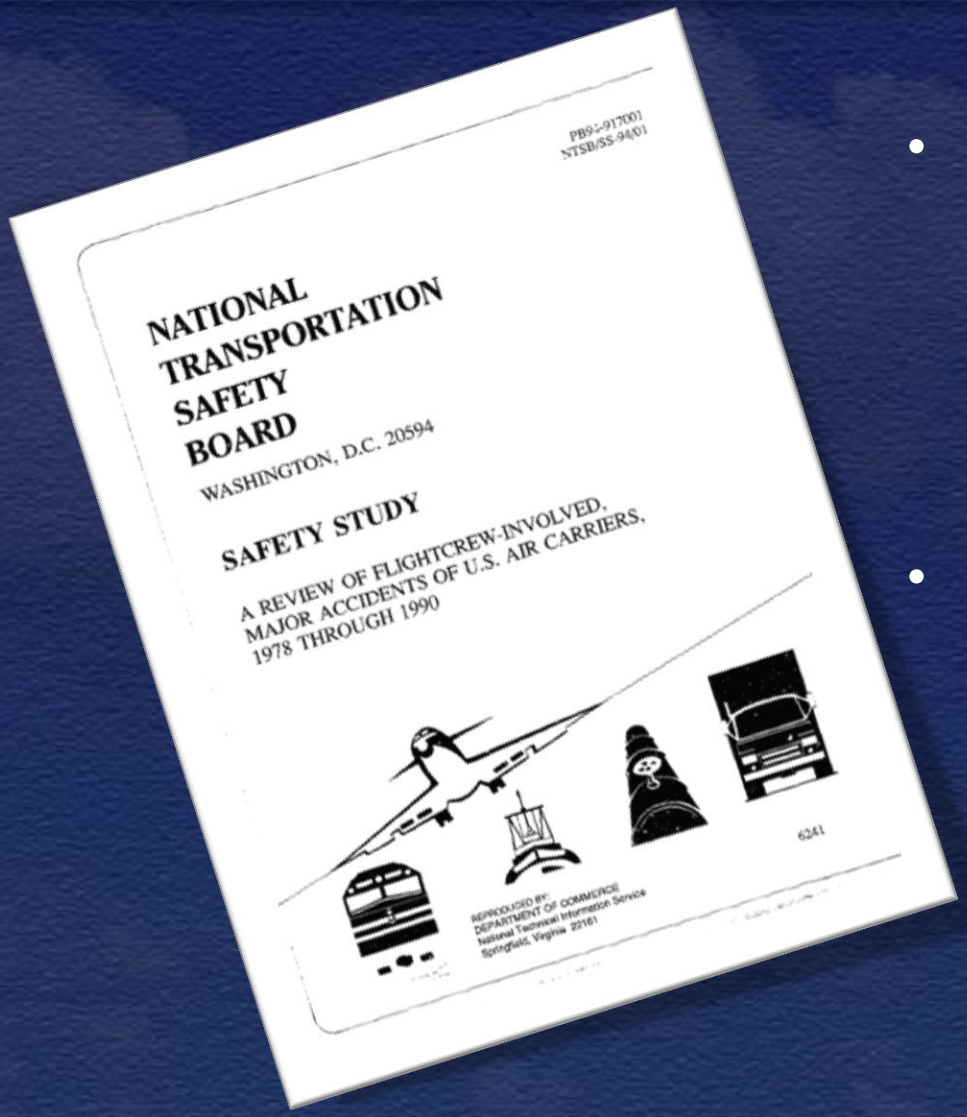
# Monitoring errors are serious




- 76% of the monitoring/challenging errors involved failure to catch something that was causal to the accident
- 17% of the monitoring/challenging errors were failure to catch something that contributed to the accident's cause

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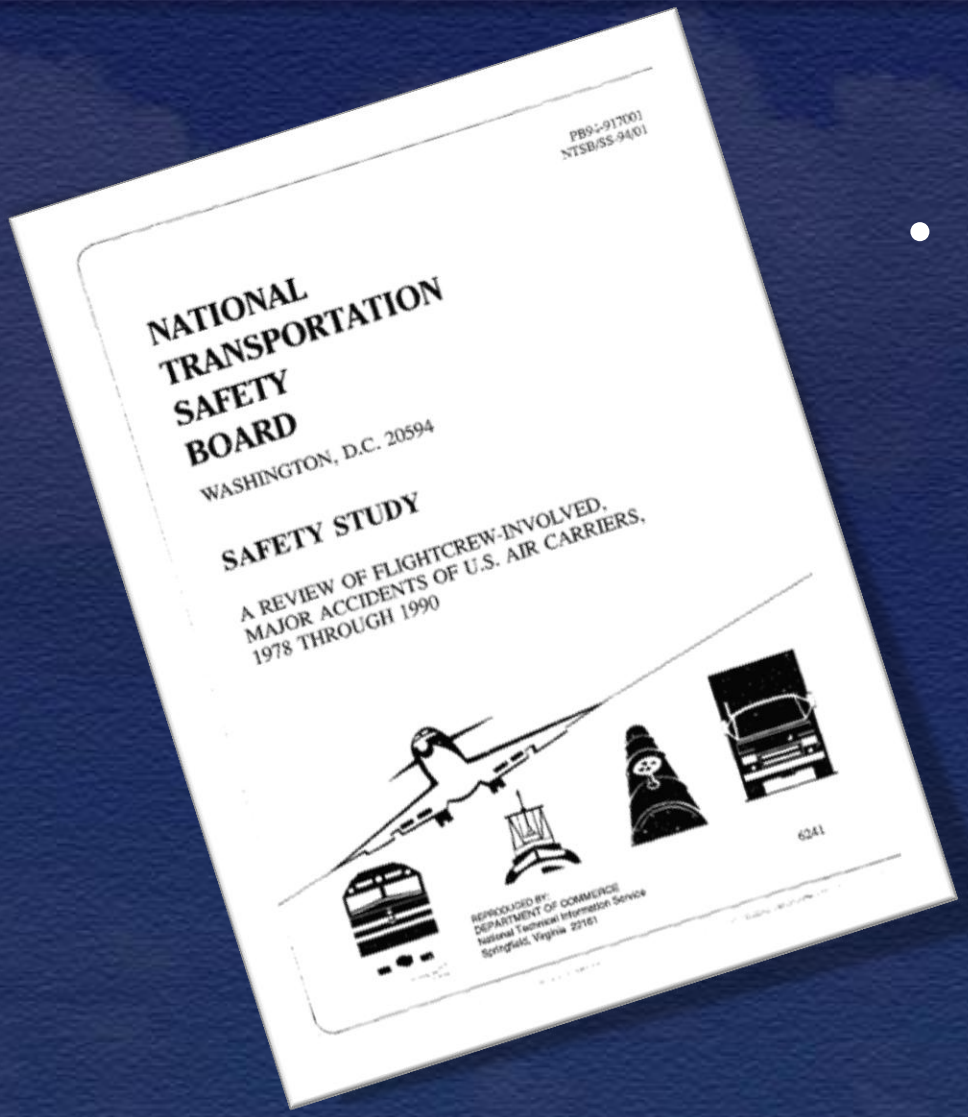


- NTSB issued two recommendations regarding training to improve monitoring/ challenging.

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# AA 1572, BDL, November 1995

- "If the First Officer had monitored the approach on the instruments...he would have been better able to notice and immediately call the Captain's attention to the altitude deviation below the minimum descent altitude."

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# King Air C90


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“If I had been watching the instruments,
I could have prevented the accident."

– **FO after being involved in fatal CFIT accident**

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# FedEx at Tallahassee, Florida

- July 26, 2002
- FedEx Boeing 727-200
- CFIT, approach and landing accident
- 3 serious injuries
- Aircraft destroyed


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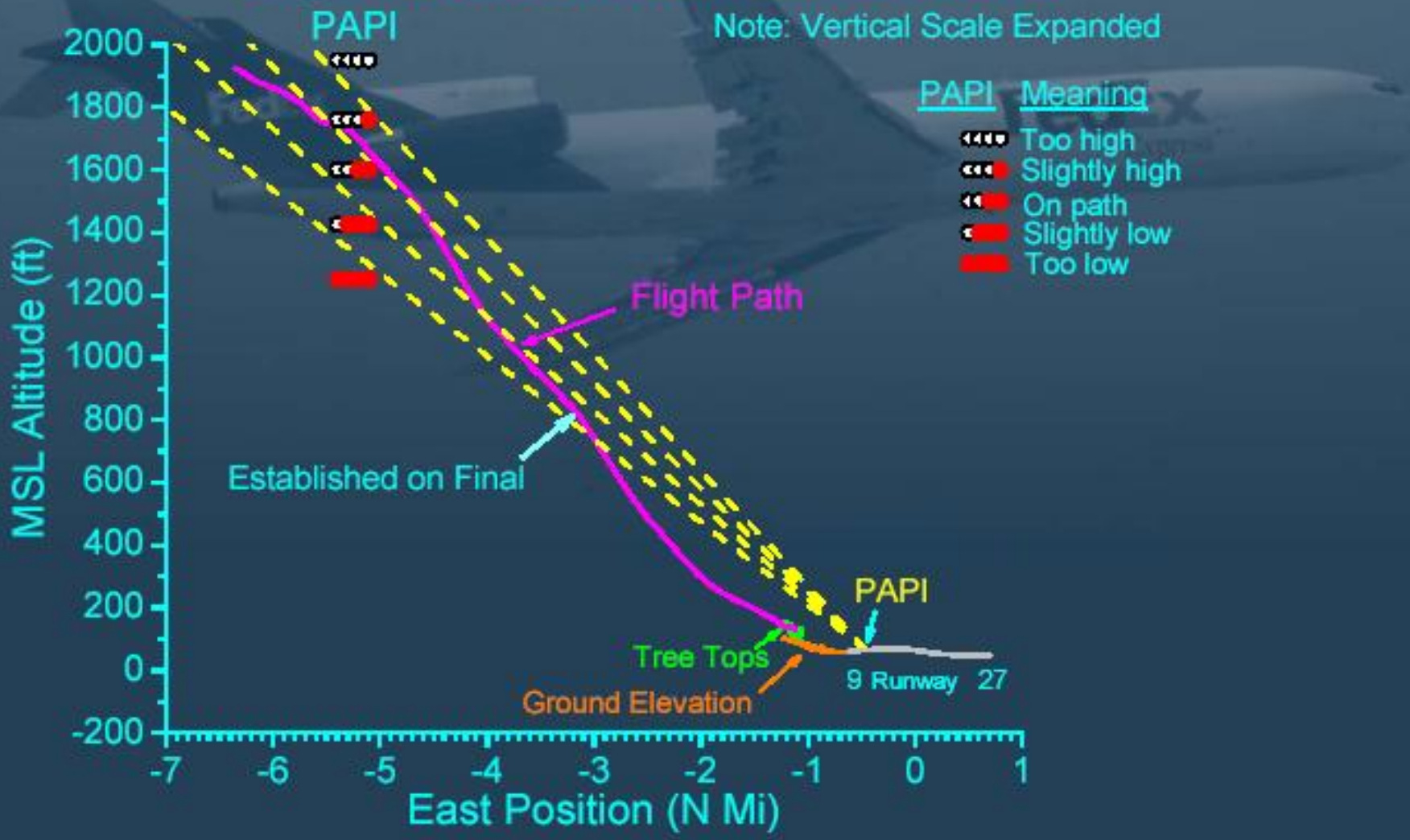
PAPI
Main Wreckage
Broken Trees

# Flight Profile with PAPI Indications



# Probable Cause

Failure to establish and maintain a proper glidepath during the night visual approach to landing.

Contributing to the accident:

- fatigue
- failure to adhere to company flight procedures
- the captain's and flight engineer's failure to monitor the approach
- the first officer's color vision deficiency.

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October 25, 2002 Eveleth, Minnesota

# NTSB Finding

- "during the later stages of the approach, the flight crew failed to monitor the airplane's airspeed and allowed it to decrease to a dangerously low level (as low as about 50 knots below the company's recommended approach airspeed) and to remain below the recommended approach airspeed for about 50 seconds."

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# G3, Nov. 22, 2004 Houston

# Probable Cause

- “The flight crew's failure to adequately monitor and cross check the flight instruments during the approach…”

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# Accident Summary


- February 16, 2005
- Pueblo, CO
- Cessna Citation 560
  - Owned by Circuit City, Operated by Martinair
- Eight fatalities
- Part 91 flight

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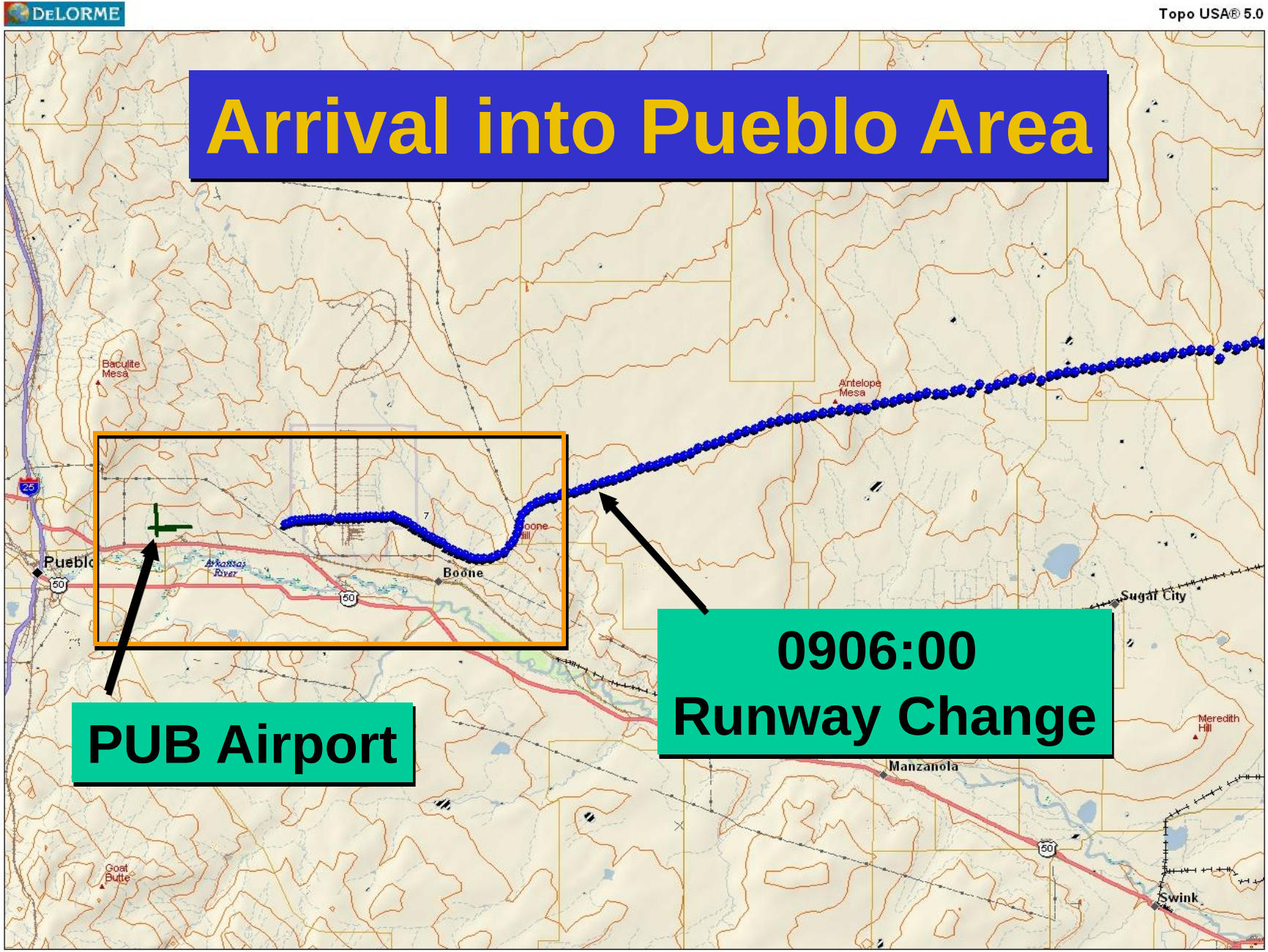
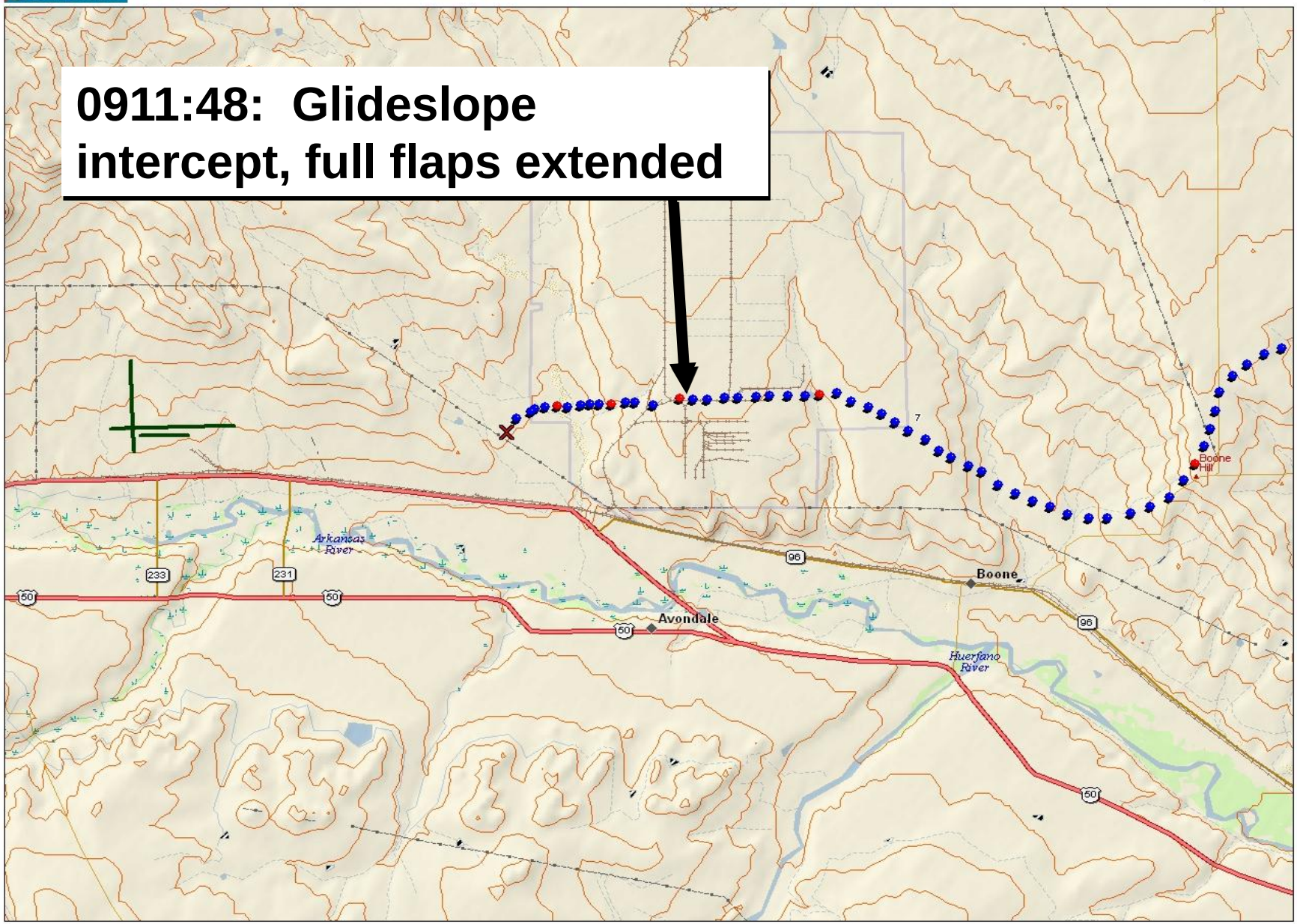

DeLORME
Topo USA® 5.0
Arrival into Pueblo Area
Baculite Mesa
Antelope Mesa
Pueblo
Boone
Arkansas River
Sugar City
Meredith Hill
Manzanola
Goat Butte
Swink
25
50
PUB Airport
0906:00
Runway Change
Data use subject to license.
© 2004 DeLorme. Topo USA® 5.0.
www.delorme.com
MN (0.0° W)
0 2 4 6 8 10 mi
Data Zoom 9-0


0911:48: Glideslope intercept, full flaps extended
DeLORME
Topo USA® 5.0
Arkansas River
Avondale
Boone
Boone Hill
Huerfano River
233
231
50
96
Data use subject to license.
© 2004 DeLorme. Topo USA® 5.0.
www.delorme.com
MN (0.0° W)
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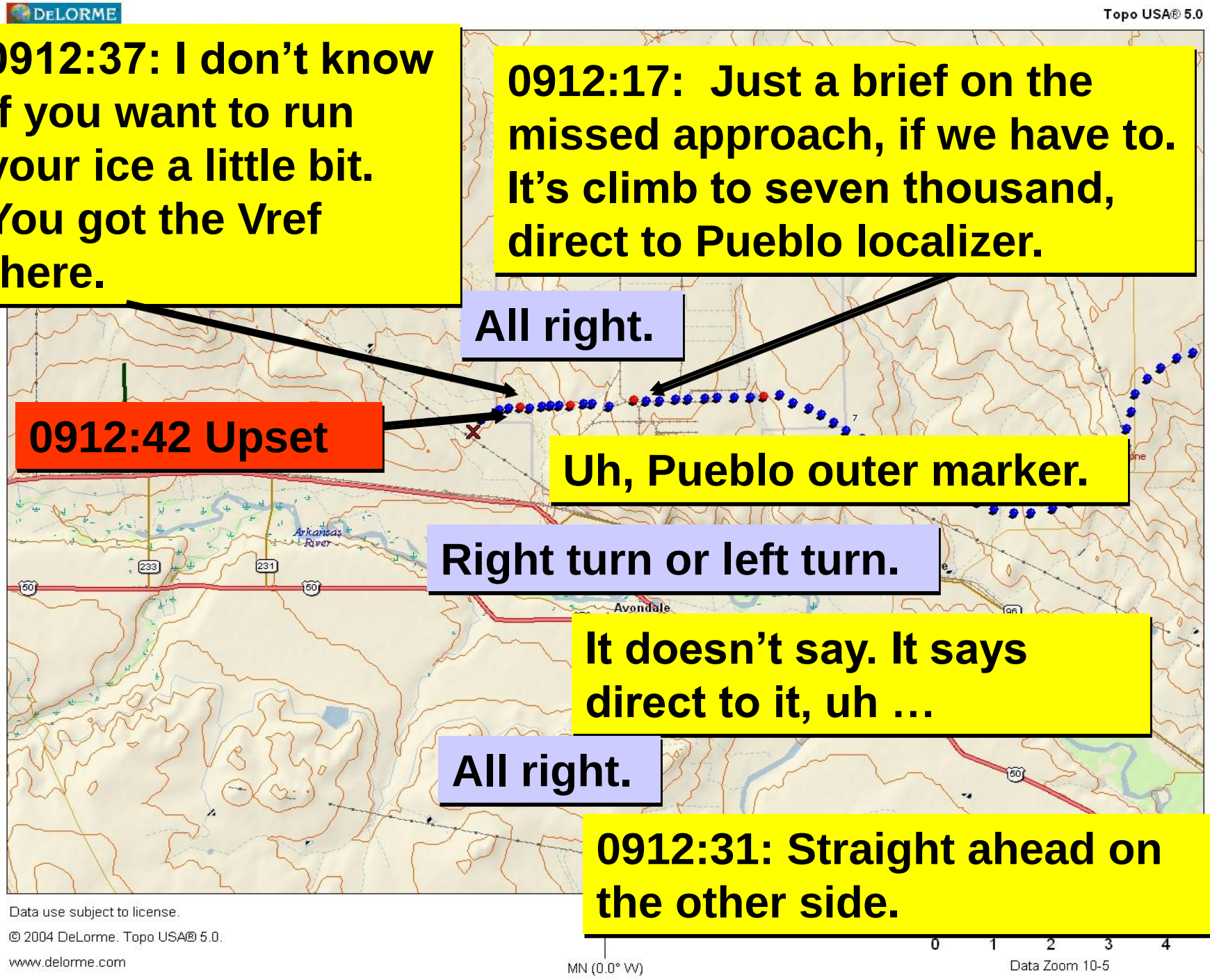
Data Zoom 10-5


DeLORME
Topo USA® 5.0
0912:37: I don't know if you want to run your ice a little bit. You got the Vref there.
0912:17: Just a brief on the missed approach, if we have to. It's climb to seven thousand, direct to Pueblo localizer.
All right.
0912:42 Upset
Uh, Pueblo outer marker.
Right turn or left turn.
It doesn't say. It says direct to it, uh …
All right.
0912:31: Straight ahead on the other side.
Arkansas River
Avondale
233
231
50
Data use subject to license.
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MN (0.0° W)
0 1 2 3 4
Data Zoom 10-5

# Upset Sequence

- Stall occurred at 1500 ft AGL
- Sudden left roll, A/P disconnect
- Airspeed at stall approx. 90 kts
- No stall warning before stall due to ice on wings

# Probable Cause

"Flight crew's failure to effectively monitor and maintain airspeed and comply with procedures for deice boot activation on the approach, which caused an aerodynamic stall from which they did not recover."

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# NTSB Finding

- "All operators would benefit from an increased focus on providing monitoring skills in their training programs…"

**NTSB Recommendation A-07-13 to FAA:**

Require pilot training programs be modified to contain modules that teach and emphasize monitoring skills and workload management and include opportunities to practice and demonstrate proficiency in these areas.

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# Colgan Air flight 3407

HOT-2: gear's down.

HOT-1: flaps fifteen before landing checklist.

HOT-2: uhhh.

National Transportation Safety Board *Board Meeting*

**22:16:27**

**130** knots **2280** feet Shaker **ON** Pusher **OFF** Power Condition Flap


Rating
Flight Idle
Max
Min
0
5
10
15
35

Heading **247** °

Pedal L R

Auto Pilot **OFF** Gear **DOWN**

# NTSB

National Transportation Safety Board

*Office of Research and Engineering*

## Flightpath

Loss of Control on Approach
Colgan Air, Inc., Operating as
Continental Connection Flight 3407
Bombardier DHC-8-400, N200WQ

Clarence Center, New York

February 12, 2009

DCA09MA027

*Board Meeting*

# NTSB Findings

- “The monitoring errors made by the accident flight crew demonstrate the continuing need for specific pilot training on active monitoring skills.”
- “Colgan Air’s standard operating procedures at the time of the accident did not promote effective monitoring behavior.”

# Probable Cause

- "… the captain's inappropriate response to the activation of the stick shaker, which led to an aerodynamic stall from which the airplane did not recover.

  Contributing to the accident: (1) the flight crew's failure to monitor airspeed in relation to the rising position of the low speed Cue…"

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# NTSB Recommendation

- Require Part *121, 135, and 91K operators to* review their standard operating procedures to verify that they are consistent with the flight crew monitoring techniques described in Advisory Circular (AC) 120-71A, “Standard Operating Procedures for Flight Deck Crewmembers”; if the procedures are found not to be consistent, revise the procedures according to the AC guidance to promote effective monitoring.

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# Reiterated Recommendation

**NTSB Recommendation A-07-13 to FAA:**

Require pilot training programs be modified to contain modules that teach and emphasize monitoring skills and workload management and include opportunities to practice and demonstrate proficiency in these areas.

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# NTSB Finding

- “If the importance of adhering to pilot monitoring responsibilities were included in flight crew training, the incident captain would have been less likely to assume control of the reverse thrust levers (a pilot flying responsibility) during the landing roll and remained focused on his pilot monitoring duties; as a result, he most likely would have observed that the speedbrakes had not automatically deployed.”

NTSB

# Reiterated Recommendation

**NTSB Recommendation A-07-13 to FAA:**

Require pilot training programs be modified to contain modules that teach and emphasize monitoring skills and workload management and include opportunities to practice and demonstrate proficiency in these areas.

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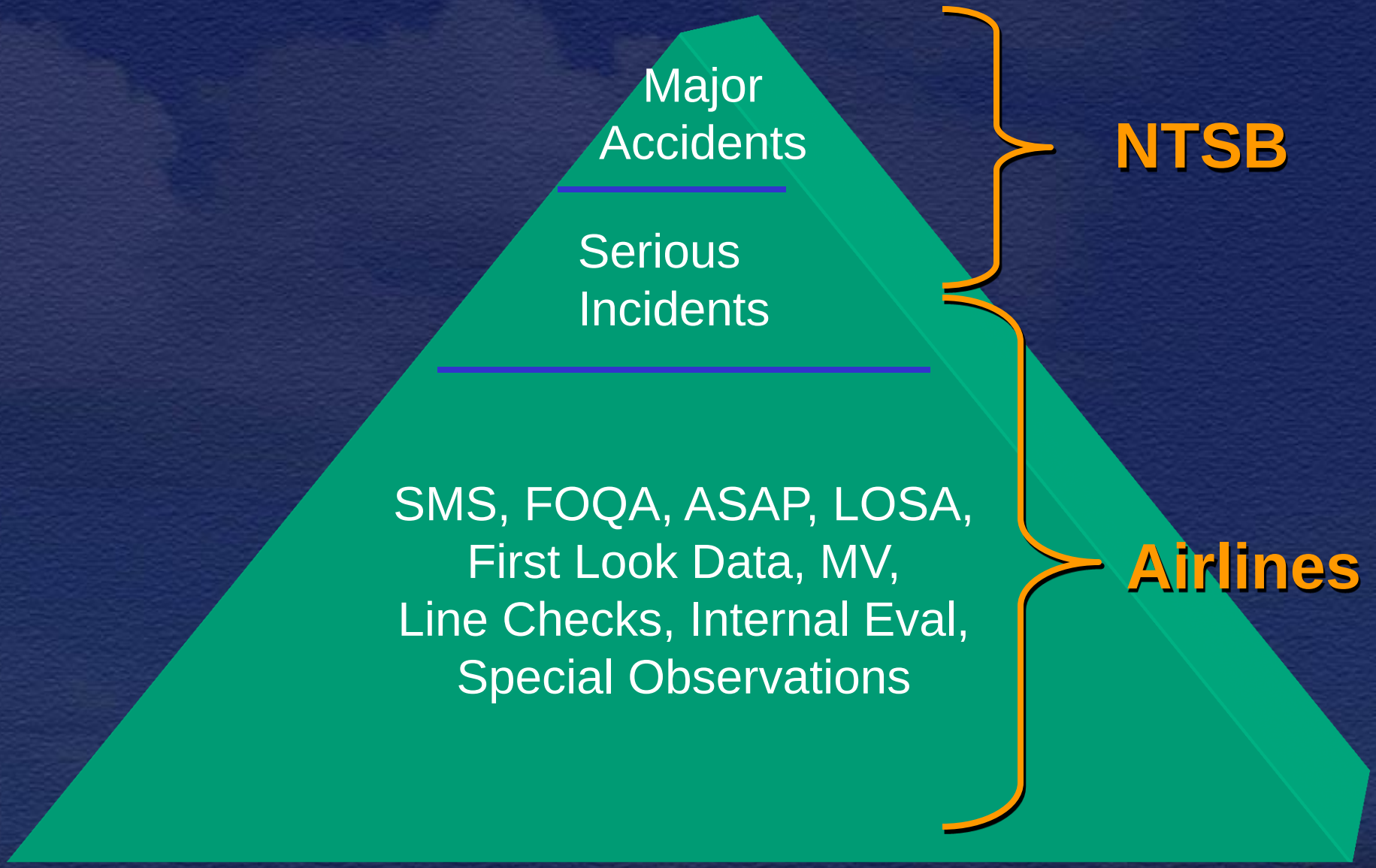

# Paradigm shift

- It must become accepted that monitoring is a “core skill,” just as it is currently accepted that a good pilot must posses good “stick and rudder” and effective communicational skills.

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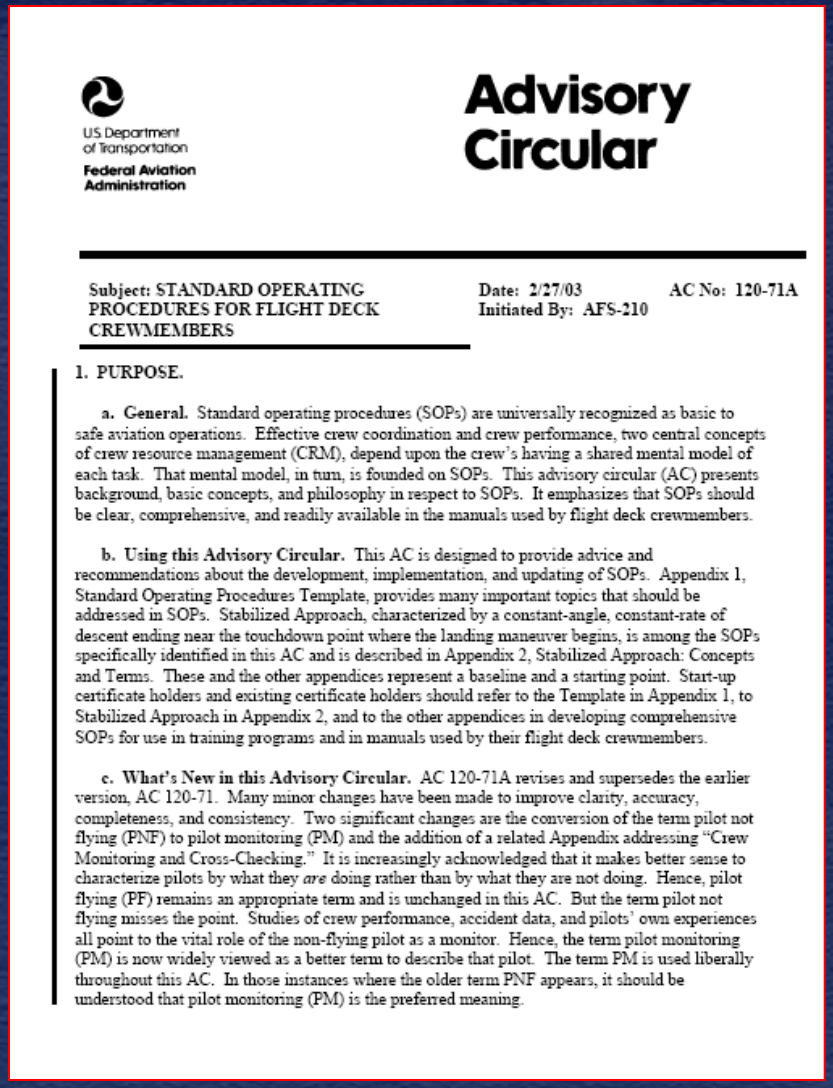
# Call to action

# A good place to start



U.S. Department of Transportation
Federal Aviation Administration

**Advisory Circular**

**Subject: STANDARD OPERATING PROCEDURES FOR FLIGHT DECK CREWMEMBERS** | **Date: 2/27/03** | **Initiated By: AFS-210** | **AC No: 120-71A**

1. PURPOSE.

**a. General.** Standard operating procedures (SOPs) are universally recognized as basic to safe aviation operations. Effective crew coordination and crew performance, two central concepts of crew resource management (CRM), depend upon the crew's having a shared mental model of each task. That mental model, in turn, is founded on SOPs. This advisory circular (AC) presents background, basic concepts, and philosophy in respect to SOPs. It emphasizes that SOPs should be clear, comprehensive, and readily available in the manuals used by flight deck crewmembers.

**b. Using this Advisory Circular.** This AC is designed to provide advice and recommendations about the development, implementation, and updating of SOPs. Appendix 1, Standard Operating Procedures Template, provides many important topics that should be addressed in SOPs. Stabilized Approach, characterized by a constant-angle, constant-rate of descent ending near the touchdown point where the landing maneuver begins, is among the SOPs specifically identified in this AC and is described in Appendix 2, Stabilized Approach: Concepts and Terms. These and the other appendices represent a baseline and a starting point. Start-up certificate holders and existing certificate holders should refer to the Template in Appendix 1, to Stabilized Approach in Appendix 2, and to the other appendices in developing comprehensive SOPs for use in training programs and in manuals used by their flight deck crewmembers.

**c. What's New in this Advisory Circular.** AC 120-71A revises and supersedes the earlier version, AC 120-71. Many minor changes have been made to improve clarity, accuracy, completeness, and consistency. Two significant changes are the conversion of the term pilot not flying (PNF) to pilot monitoring (PM) and the addition of a related Appendix addressing "Crew Monitoring and Cross-Checking." It is increasingly acknowledged that it makes better sense to characterize pilots by what they *are* doing rather than by what they are not doing. Hence, pilot flying (PF) remains an appropriate term and is unchanged in this AC. But the term pilot not flying misses the point. Studies of crew performance, accident data, and pilots' own experiences all point to the vital role of the non-flying pilot as a monitor. Hence, the term pilot monitoring (PM) is now widely viewed as a better term to describe that pilot. The term PM is used liberally throughout this AC. In those instances where the older term PNF appears, it should be understood that pilot monitoring (PM) is the preferred meaning.

- AC 120-71A, "Standard Operating Procedures for Flight Deck Crewmembers"
  - Appendix 19

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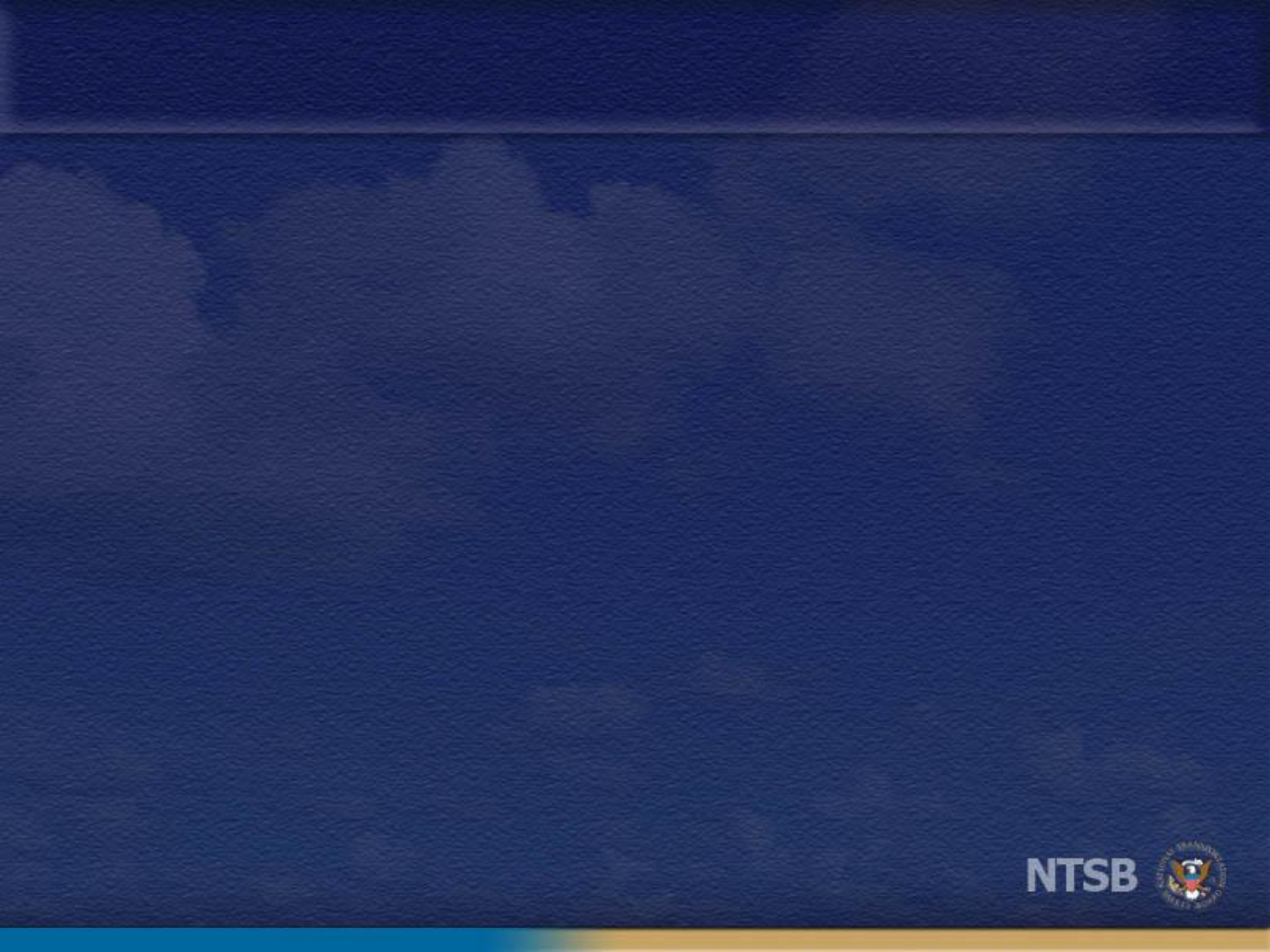
# NTSB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