

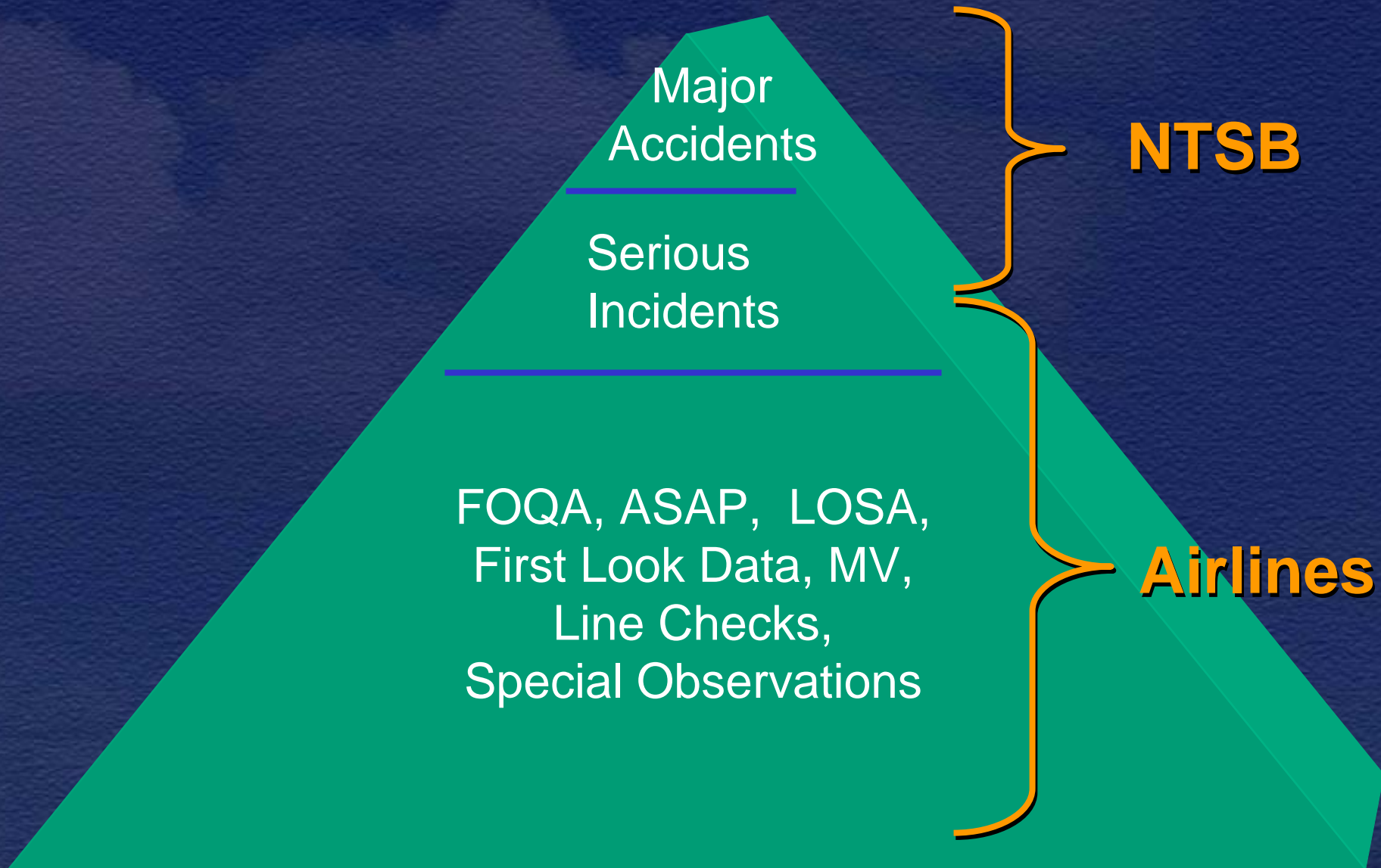


NTSB National Transportation Safety Board

An NTSB Board Member's Perspective

Robert L. Sumwalt

Primary Sources of Data



From my perspective...



- Monitoring and Cross-checking
- Sterile Cockpit Violations

Monitoring and Cross-Checking

NTSB



Monitoring and Cross Checking

- Inadequate crew monitoring or challenging was a factor in 31 of 37 (84 percent) crew-caused air carrier accidents reviewed in a NTSB safety study.
 - 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

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.”

Accident Summary

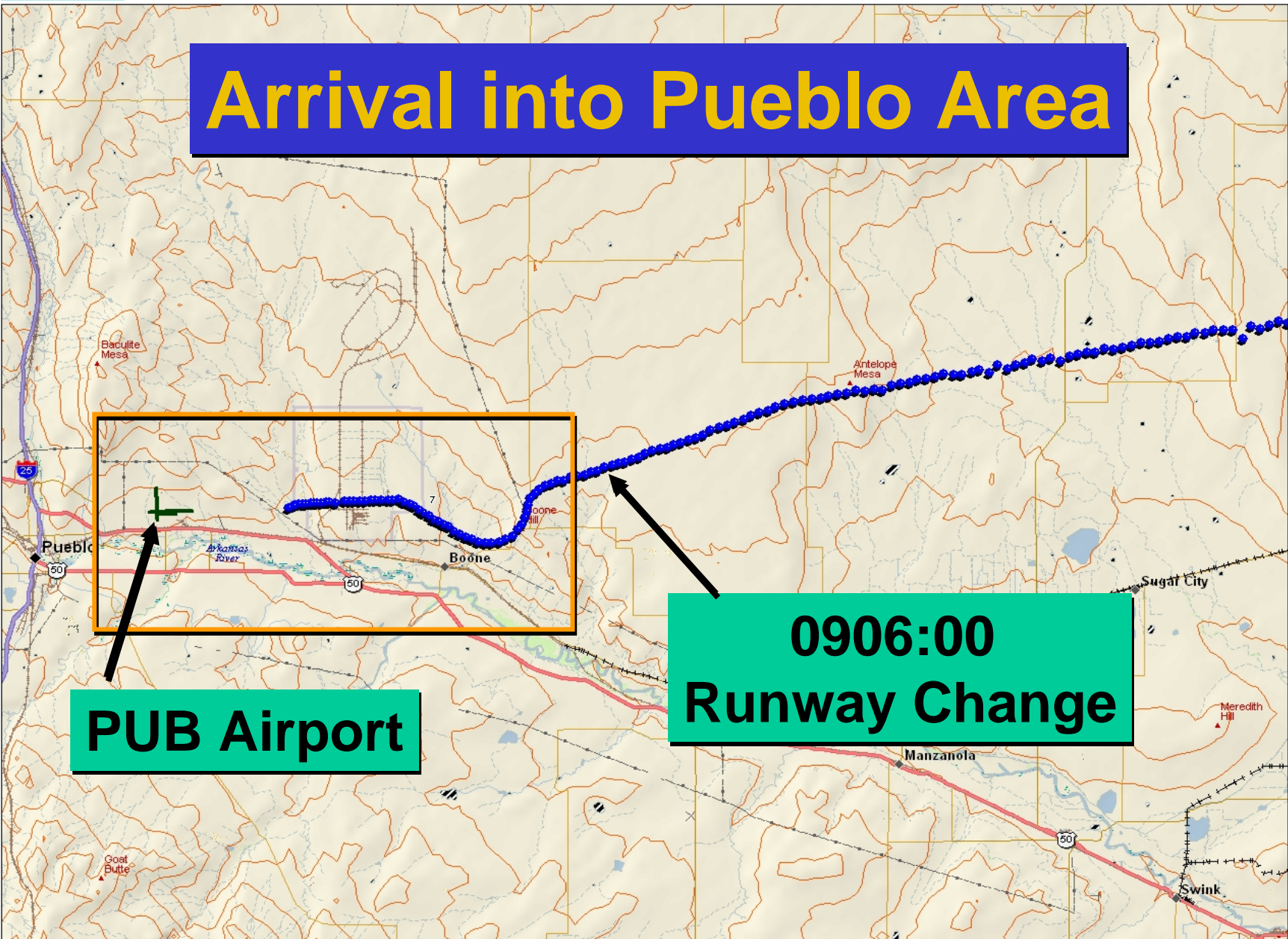
- February 16, 2005
- Pueblo, CO
- Cessna Citation 560
 - Owned by Circuit City, Operated by Martinair
- Eight fatalities
- Part 91 flight



Key Findings

- Icing encountered on descent and approach
- Airspeed not maintained on approach
- De-icing boots not operated on approach
- No stall warning before stall

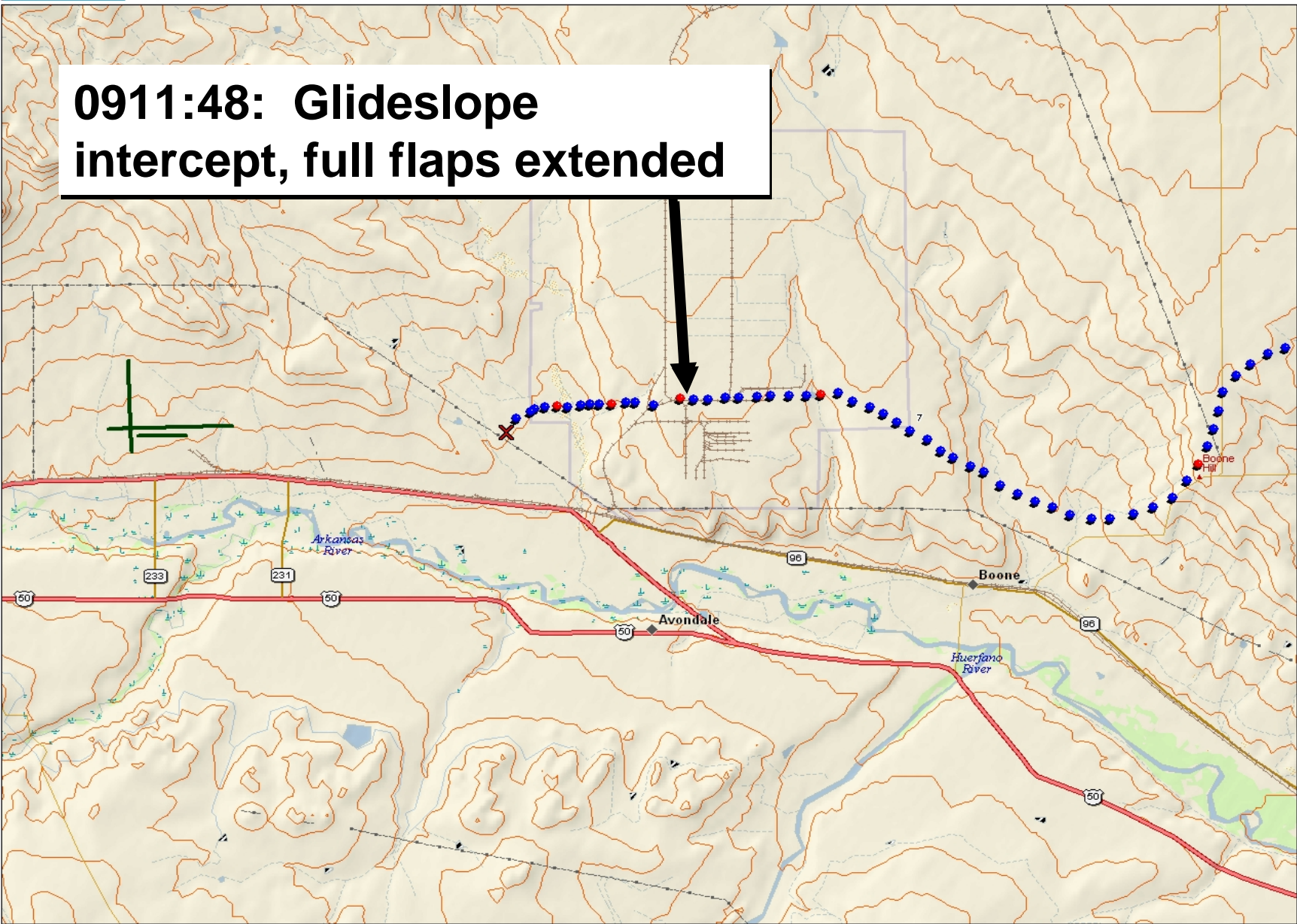
Arrival into Pueblo Area



PUB Airport

**0906:00
Runway Change**

**0911:48: Glideslope
intercept, full flaps extended**



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

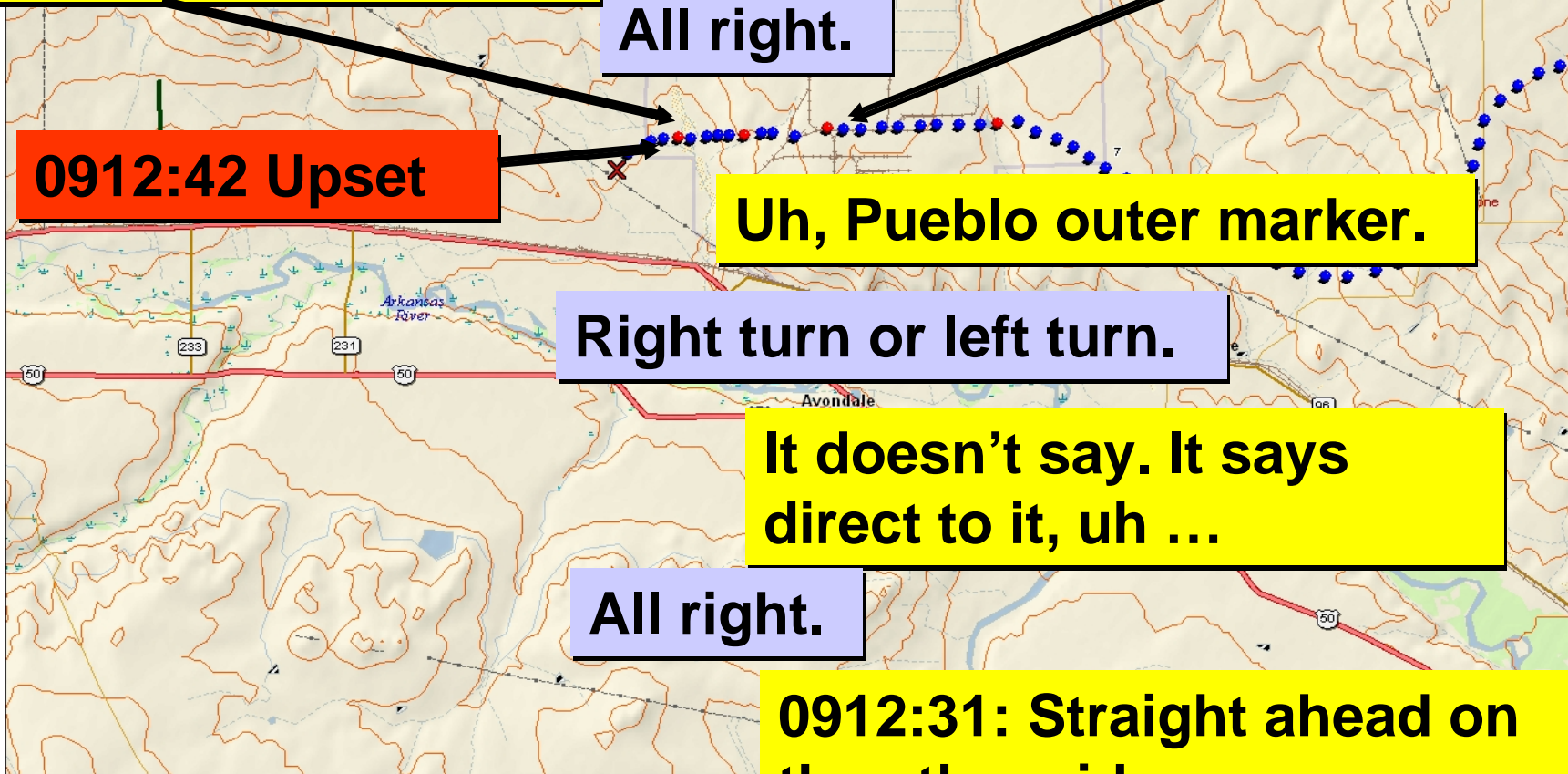
Uh, Pueblo outer marker.

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.



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.”

NTSB Finding

- “All operators would benefit from an increased focus on providing monitoring skills in their training programs...”

NTSB Recommendation 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.

A good place to start



US Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: STANDARD OPERATING
PROCEDURES FOR FLIGHT DECK
CREWMEMBERS

Date: 2/27/03 AC No: 120-71A
Initiated By: AFS-210

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

Sterile Cockpit Violations

NTSB



Comair Airlines Flight 5191

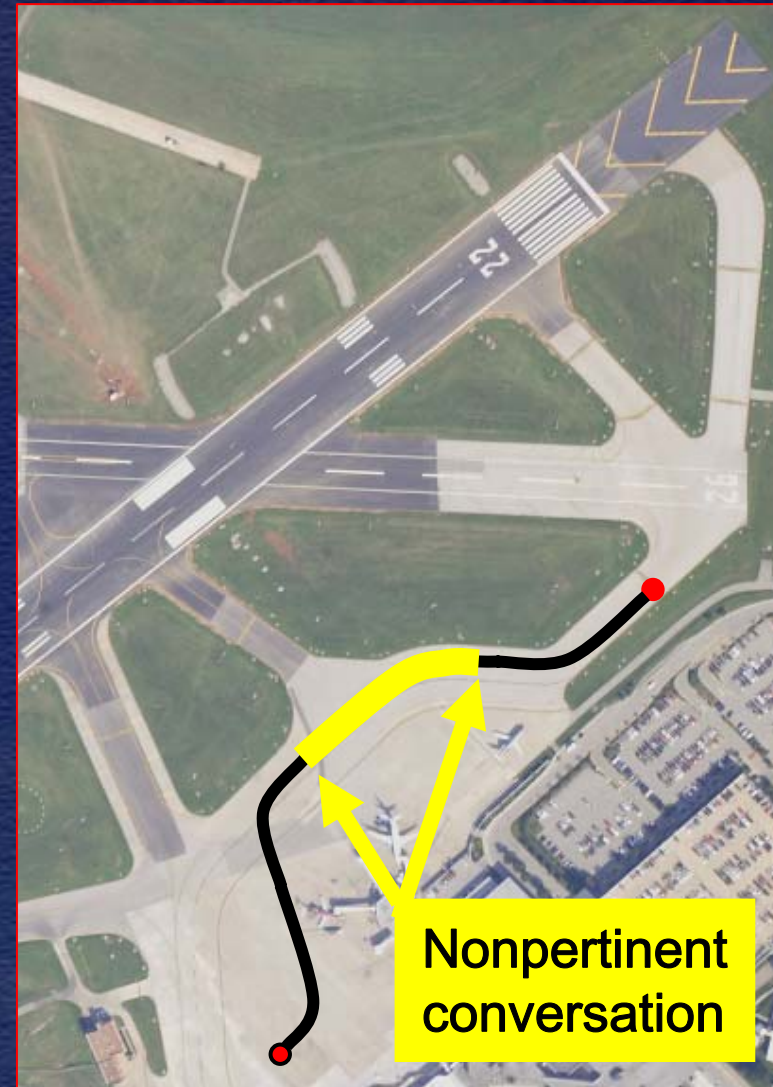
Lexington, Kentucky

- Bombardier CRJ
- 49 Fatalities
- First officer severely injured
- Wrong runway takeoff



Sterile Cockpit Violation

- 40 of the 150 seconds during taxi were violations of sterile cockpit rule
- Distraction likely contributed to loss of positional awareness



The Probable Cause statement

“Contributing to the accident [was] the flight crew’s nonpertinent conversation during taxi, which resulted in a loss of positional awareness ...”

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NTSB National Transportation Safety Board

SMS: A Practical Look

Pinnacle Airlines Flight 3701

Jefferson City, Missouri



- October 14, 2004
- Bombardier Regional Jet
- Repositioning flight
- Both flight crewmembers killed

NTSB Conclusion

- “All air carriers would benefit from Safety Management System programs because they would require the carriers to incorporate formal system safety methods into the carriers’ internal oversight programs.”

NTSB Recommendation to FAA

“Require that all [air carriers] establish Safety Management System programs.”

– NTSB Recommendation A-07-10

What is a Safety Management System?

“A SMS is an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies, and procedures.”

– ICAO (Doc 9859 SMM)

When you have SMS, the company ...

- Systematically attends to those things it believes are important.
- Manages and values safety, just as they manage and value other vital business functions.
 - **Finance:** CFO, General Accepted Accounting Practices (GAAP), procedures, controls, audits, accountability

SMS Components

1. Written policies, procedures and guidelines
2. Data collection and analysis
3. Risk management
4. Safety culture

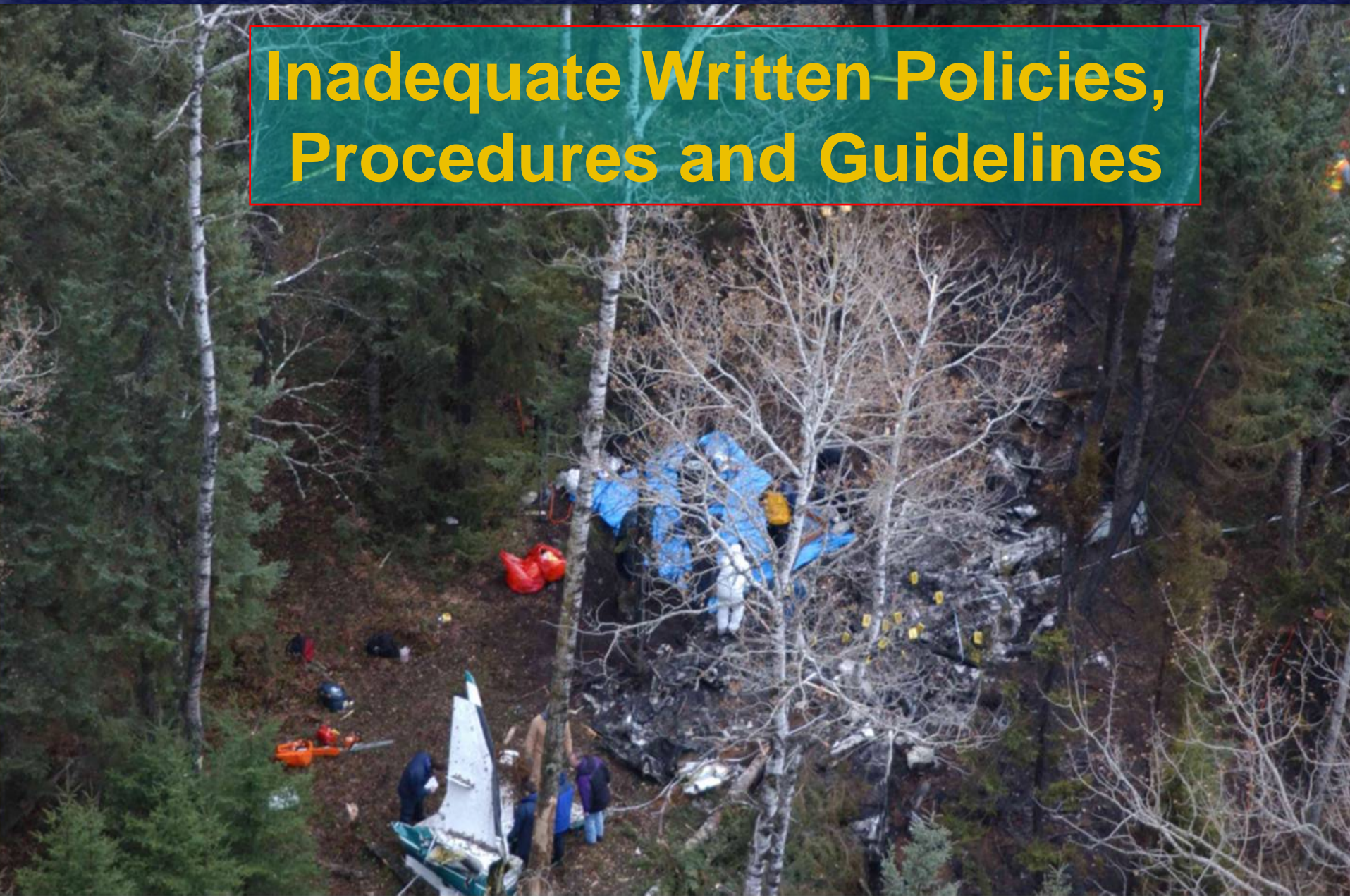
SMS Components

1. **Written policies, procedures, guidelines**

Potential Gaps

- The organization does not have adequate written policies, procedures and guidelines.
 - or –
- They don't rigorously adhere to what they do have.

Inadequate Written Policies, Procedures and Guidelines



Inadequate procedures

- Key procedures for briefing and conducting instrument approaches were in “Maneuvers Guide”
 - Pilots were expected to adhere to procedures in “Maneuvers Guide”
 - “Maneuvers Guide” was only issued to the chief pilot and instructors
- Company pilot: never seen any standardized callouts documented in any company manual
 - To compensate, she used callouts she used at another company

Non-Compliance

- Company check airman: rated company's standardization as "6" on a 1 – 10 scale.
- Lead ground instructor: "Fair"
 - Suspected that some pilots were following SOPs while others were not

July 10, 2007, Sanford, FL



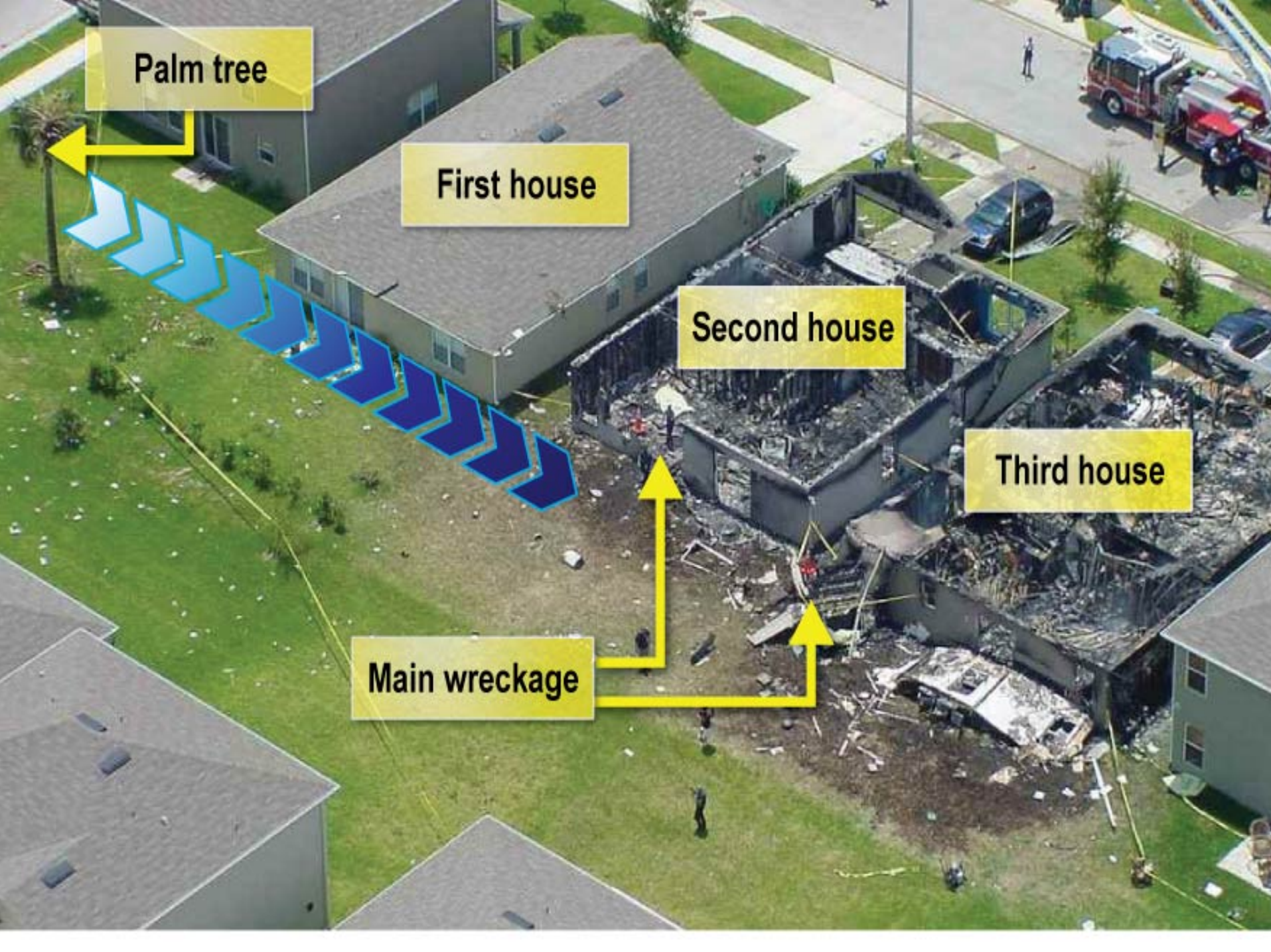
- Cessna 310 owned by NASCAR
- 5 fatalities

Declared Emergency
Requested Diversion.

“Smoke in the cockpit.”

“Shutting off radios, elec.”





Palm tree

First house

Second house

Third house

Main wreckage



Maintenance Discrepancy Entry

AIRCRAFT: N561N	DATE: 07-09-07	-ACTT	
		-ACTL	
MAINTENANCE WRITE-UP		MAINTENANCE CLEARING ACTION	
Entered By: ACT	Location: DAB	<input type="checkbox"/> Repaired	<input type="checkbox"/> Replaced
		<input type="checkbox"/> Released- Could Not Duplicate	<input type="checkbox"/> Loaner Installed
RADAR WENT BLANK DURING CRUISE FLIGHT. RECYCLED - NO RESPONSE... SMELL OF ELECTRICAL COMPONENTS BURNING		Corrective Action:	
TURNED OFF UNIT - PULLED RADAR C.B. - SMELL WENT AWAY. -			
RADAR INOP			

“SMELL OF ELECTRICAL COMPONENTS BURNING”



Inadequate Procedures

- Maintenance forms not serialized, tracked, or retained
 - Yellow copy never provided
- No procedures for providing flight operations personnel (pilots and dispatchers) with airplane airworthiness information.
- 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

SMS Components

2. Data collection and analysis

Data leads to informed Risk Management

- “Hazards and incidents resulting from department operations shall be identified at all levels.
- “Conditions and acts posing unacceptable risk shall be eliminated or changed to prevent personal injury or illness and property damage or loss.”
 - NBAA Prototypical Safety Manual

SMS Components

3. Risk Management

Risk Management

“We manage risk whenever we modify the way we do something to make our chances of success as great as possible, while making our chances of failure, injury or loss as small as possible.”

– FAA System Safety Handbook

Step 1: Identify Hazards



HAZARDS

- No precision approach
- No operational tower at night



Flight Safety Foundation











ALAR

Approach-and-landing Accident Reduction









Tool Kit

Approach-and-landing Risk Awareness Tool

Airport Services and Equipment

No approach radar service or airport tower service	  
No current local weather report	 
Unfamiliar airport or unfamiliar procedures	 
Minimal or no approach lights or runway lights	
No visual approach-slope guidance — e.g., VASI/PAPI	
Foreign destination — possible communication/language problems	

Expected Approach

Nonprecision approach — especially with step-down procedure or circling procedure	  
Visual approach in darkness	 
Late runway change	 
No published STAR	

Step 2: Assess Hazards

PROBABILITY

	Unlikely	Seldom	Occasional	Likely
S E V E R I T Y	Catastrophic	3	4	4
	Critical	1	2	4
	Marginal	1	1	3
	Negligible	1	1	2

Hazard

No precision approach
No operational tower

RAC

3 (Seldom, Catastrophic)
3 (Seldom, Catastrophic)

Step 3: Make Risk Decisions & Develop Controls

HAZARDS

- No precision approach
- No operational tower

CONTROLS

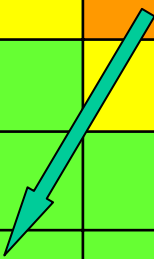
We will not use this airport:

- between sunset and sunrise when control tower is closed, and
- when the weather is forecast below 800/2.



Determining Residual Risk

		PROBABILITY			
		Unlikely	Seldom	Occasional	Likely
S E V E R I T Y	Catastrophic	2	3	4	4
	Critical	1	2	3	4
	Marginal	1	1	2	3
	Negligible	1	1	2	2



Hazard

No precision approach

No operational tower

RAC

1 (Unlikely, Negligible)

1 (Unlikely, Negligible)

SMS Components

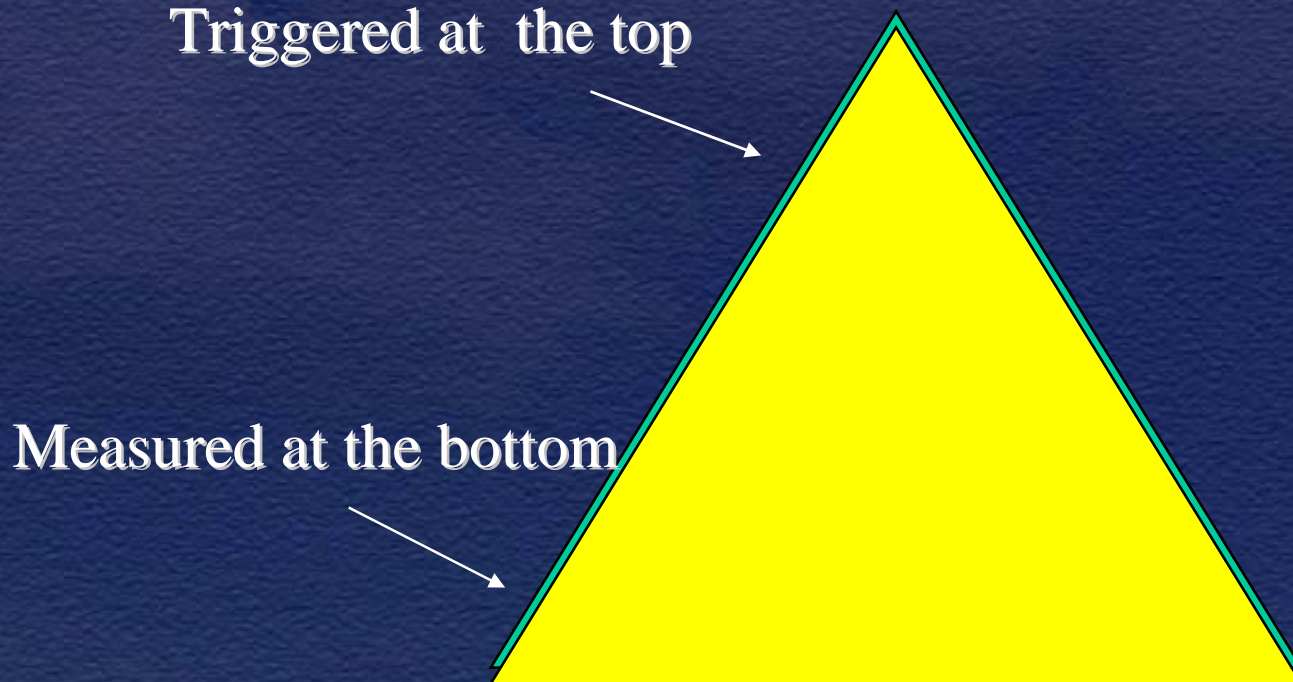
4. Safety Culture

Safety Culture

Do employees do the right things,
even when no one is watching.



Safety Culture is:



Safety culture starts at the top of the organization and permeates the entire organization.

SMS Components

1. Written policies, procedures and guidelines
2. Data collection and analysis
3. Risk management
4. Safety culture



NTSB

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