

NTSB Accident Investigations

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Carbon on the mountain...

🔴 December 22, 1996

Carbon on the mountain...

- 🟢 December 22, 1996
- 🟢 Airborne Express 827



Carbon on the mountain...

- ◆ December 22, 1996
- ◆ Airborne Express 827
- ◆ Killed 5 pilots/techs



Carbon on the mountain...

- ◆ December 22, 1996
- ◆ Airborne Express 827
- ◆ What could have brought a DC-8 down?

Carbon on the mountain...



Carbon on the mountain...

- ◆ What could have brought a DC-8 down?

Carbon on the mountain...

- ◆ What could have brought a DC-8 down?
- ◆ What am I doing here?

My path to that mountain, and after

About the NTSB

- ◆ Roots
- ◆ Independence
- ◆ Probable Cause
- ◆ Annex 13

About the NTSB

- ◆ Party system
- ◆ A fact is a squirrely thing
- ◆ Sunshine process
- ◆ Outputs—
 - ◆ Bluecover reports
 - ◆ Safety recommendations

NTSB Investigation of ABX 827

- ◆ My role: operations investigation and overall analysis
- ◆ Proximate cause: Flying too slowly
- ◆ But...
- ◆ Factors underlying this simple accident

History of the Flight

- ◆ Planned Functional Evaluation Flight after major maintenance
- ◆ Departed late due to mechanical issues
- ◆ Darkness and cloud layers
- ◆ Test card required evaluation of stall warning system
- ◆ 14,000 feet just on top, slowed at 1 knot per second
- ◆ Buffet at 151 knots, “That’s a stall right there, ain’t no shaker.”
- ◆ Steep descent and 1:32 later– crash into the mountains at 240 knots

History of the Flight

- ◆ Proximate cause: Flying too slowly
- ◆ But... factors underlying this simple accident
- ◆ One Pager, Learjet ride and ATV ride later...

On Scene Investigation

- ◆ Flight deck documentation: not much to see
- ◆ Impact angle and attitude from tree breaks
- ◆ Four corners found, engines ate dirt
- ◆ Flight data recorder: 11 parameter unit
- ◆ Cockpit voice recorder: 30 minute tape loop

Wilmington Investigation

- ◆ Pilot background and experience
 - ◆ PM: USAF, Flight manager, examiner, instructor, 463 hours in T/P
 - ◆ PF: Flight manager, instructor, 434 hours in T/P
- ◆ FEF experience: PM SIC, no stalls; PF no prior
- ◆ Simulator evaluation and fidelity
- ◆ Previous incident and FEF/stall procedures evaluation

Laboratory Investigation

- ◆ CVR readout and transcript: inside the chamber
- ◆ FDR readout
- ◆ Vehicle performance study: Inferences (few parameters) and implications
- ◆ Video re-creation of accident sequence

CVR Review

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1807:55 CAM	[sound similar to engine increasing in RPM]		
1808:06 CAM-1	some buffet.		
1808:07 CAM-2	yeah, that's pretty early. *		
1808:09 CAM	[sound of rattling]		
1808:11 CAM-3	that's a stall right there. * ain't no shaker.		
1808:13 CAM	[sound similar to increase in engine RPM]		
1808:13 CAM-1	set max power.		
1808:14 CAM-2	one thirty three.		
1808:17 CAM-3	* power.		
1808:19 CAM-1	one forty's about where I'm at.		

95

CVR Review

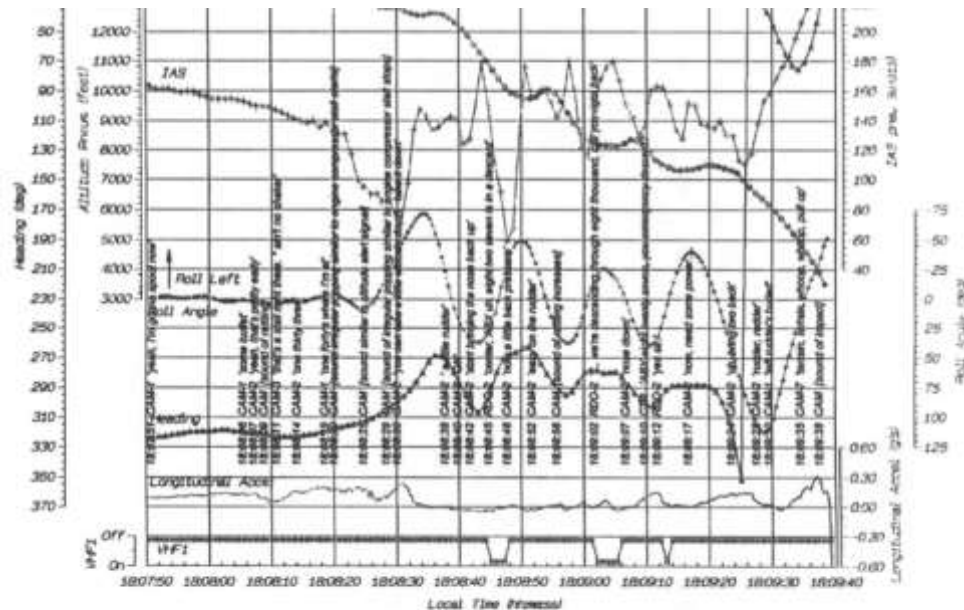
INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME & SOURCE	CONTENT	TIME & SOURCE	CONTENT
1808:25 CAM	[sound similar altitude alert signal]		
1808:25 CAM-3	** pull her back.		
1808:26 CAM-2	you got it.		
1808:29 CAM	[sound of irregular popping similar to engine compressor stall stops]		
1808:30 CAM-2	you can take a little altitude down. take it down.		
1808:32 CAM-1	** control, [spoken with buffeting voice]		
1808:36 CAM	[sound similar to engine decreasing in RPM]		
1808:38 CAM-2	a little rudder.		
1808:39 CAM-1	all right.		
1808:40 CAM-2	OK.		
1808:42 CAM-2	start bringing the nose back up.		

CVR Review

SOURCE	CONTENT	SOURCE	CONTENT
1809:28 CAM-1	I got it.		
1809:29 CAM-2	left rudder.		
1809:30 CAM-1	left rudder's buried.		
1809:32 CAM-2	OK, easy, don't. OK now, easy bring it back.		
1809:35 CAM-7	terrain, terrain, whoop, whoop, pull up.		
1809:36 CAM-?	(really, really)		
1809:38 CAM	[sound of impact]		
1809:39			

Vehicle Performance Study

Let's do one!



plot4bf1
Revised February 04, 1997

National Transportation Safety Board c/j

Organizational factors/corporate culture

- ◆ Director of flight technical programs
- ◆ Training of FEF pilots
- ◆ Previous incident and stall procedure change
- ◆ Reversion to previous procedure: “We don’t need that.”
- ◆ Pressures to perform

Accident Analysis

- ◆ Now we know what happened— so *why* did it happen?
- ◆ Engines
- ◆ Aircraft
- ◆ Stall was intentional, so how did they not know?

Accident Analysis

- ◆ How does a pilot know the aircraft is stalled?
- ◆ How does a pilot know the aircraft is unstalled?
- ◆ Stall vs. Nose-low, high speed roll upset
- ◆ Role of distraction (engine, rolling moments)
- ◆ Experience– positive and negative (simulator)

Accident Analysis

- ◆ Procedures and procedural change
- ◆ Risk factors (night, cloud...)
- ◆ Cognitive biases

Accident Analysis

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 - ◆ Plan continuation

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 - ◆ Confirmation

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Accident Analysis

🟢 Was this crew deficient?

Accident Analysis

- Was this crew deficient?
 - Back pressure inputs

Accident Analysis

- Was this crew deficient?
 - Back pressure inputs
 - Own own bias

Accident Analysis

- ◆ Was this air carrier deficient?
 - ◆ Safety management/improvement process
 - ◆ Risk evaluation in test flight program
 - ◆ Weather/lighting
 - ◆ Crew pairing
 - ◆ “I do the flying”

The Probable Cause

The National Transportation Safety Board determines that the probable causes of this accident were the inappropriate control inputs applied by the flying pilot during a stall recovery attempt, the failure of the nonflying pilot-in-command to recognize, address, and correct these inappropriate control inputs, and the failure of ABX to establish a formal functional evaluation flight program that included adequate program guidelines, requirements and pilot training for performance of these flights. Contributing to the causes of the accident were the inoperative stick shaker stall warning system and the ABX DC-8 flight training simulator's inadequate fidelity in reproducing the airplane's stall characteristics.

Corporate aftermath of ABX 827

- ◆ Millions of dollars in losses (billions)
- ◆ Managers tied up with litigation for years
- ◆ Managers on my team all lost their jobs
- ◆ Company no longer exists (remnant now belongs to Amazon.com)

Safety results of the accident

- ◆ What would you recommend?

Safety results of the accident

Evaluate the data available on the stall characteristics of airplanes used in air carrier service and, if appropriate, require the manufacturers and operators of flight simulators used in air carrier pilot training to improve the fidelity of these simulators in reproducing the stall characteristics of the airplanes they represent to the maximum extent that is practical; then add training in recovery from stalls with pitch attitudes at or below the horizon to the special events training programs of air carriers. (A-97-47)

Safety results of the accident

- ◆ Has this happened again???? (Sigh...)

Thanks very much!

Questions/Comments
Welcome
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