



NTSB National Transportation Safety Board

Inadequate Monitoring and Cross-checking

How do we make vast improvements?

Robert L. Sumwalt

Air Line Pilots Association, International

American Airlines

Atlas Air

Boeing

Delta Air Lines

Federal Aviation Administration

FedEx Express

jetBlue

LOSA Collaborative

National Aeronautics and Space Administration

National Transportation Safety Board

Southwest Airlines Pilots Association

US Airways

U.S. Navy

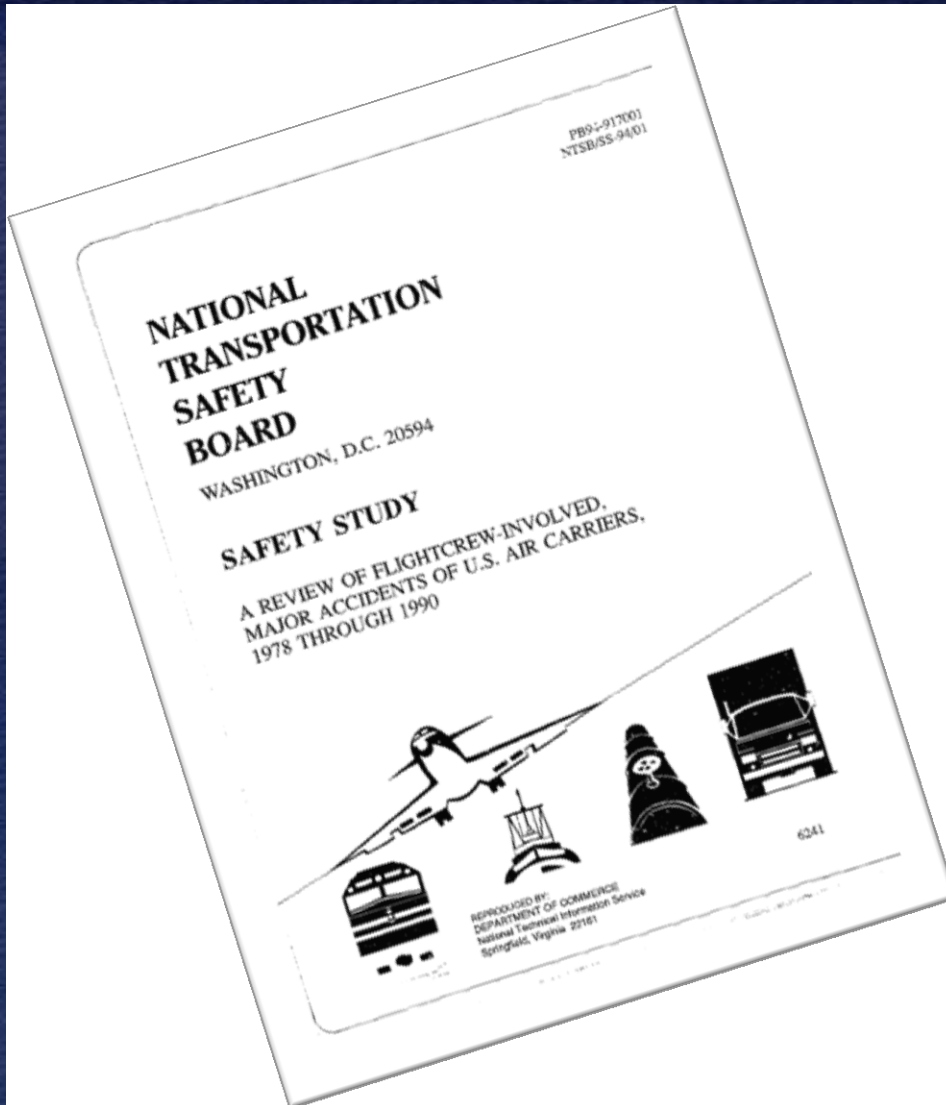
ACTIVE PILOT MONITORING WORKSHOP



HOSTED BY
Delta Air Lines
February 5 – 7, 2013

NTSB



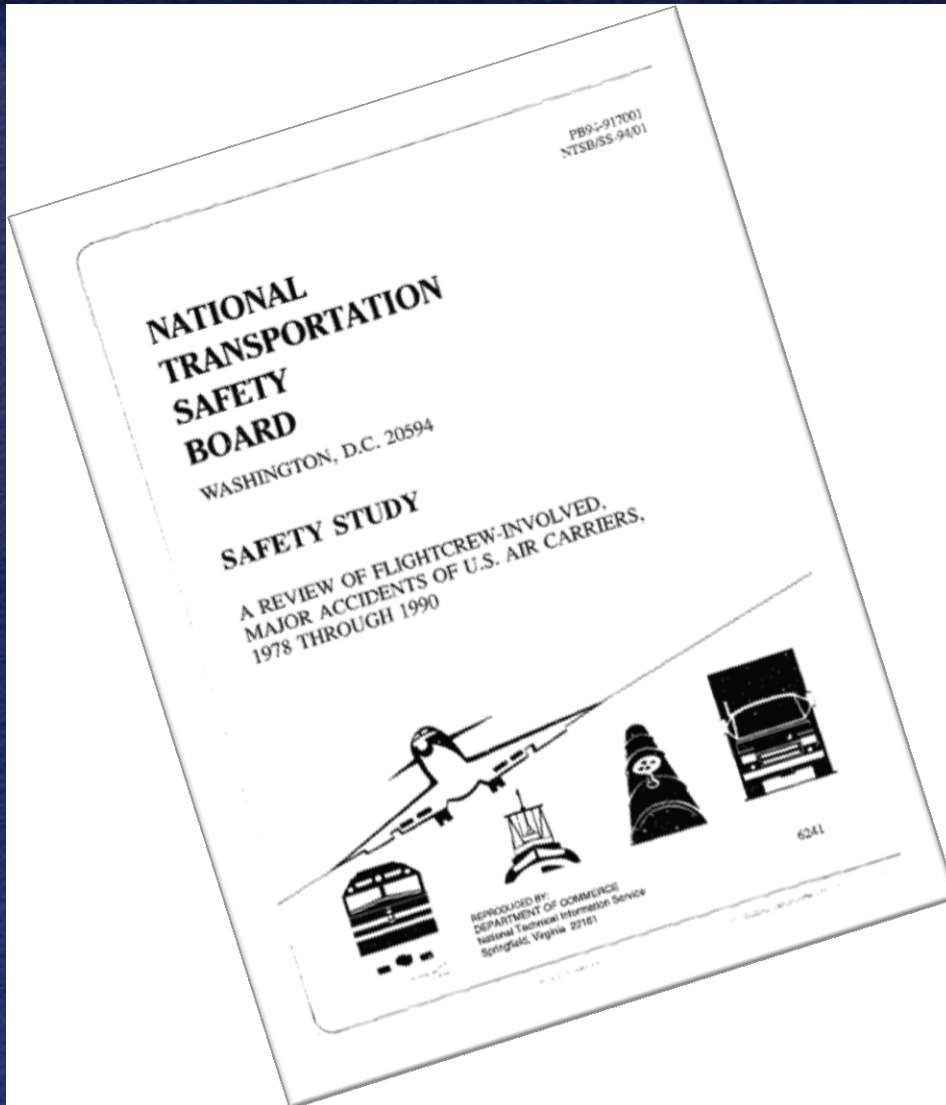


adequate crew monitoring or challenging as a factor in 31 of 37 (84 percent) reviewed accidents.

NTSB



Monitoring errors are serious



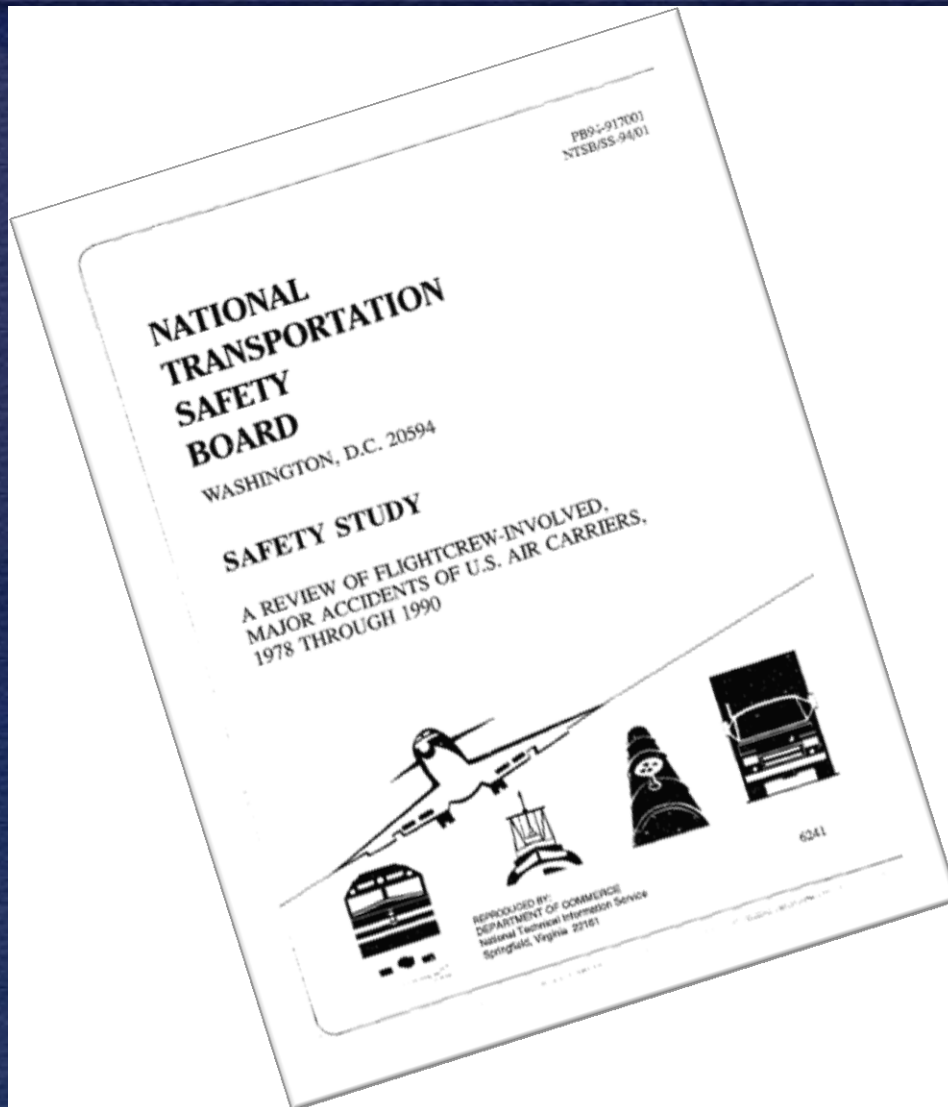
76% of the monitoring/challenging errors involved failure to catch something that was causal to the accident

17% of the monitoring/challenging errors were failure to catch something that contributed to the accident's cause

NTSB



Bad news, Good news



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

NTSB



FAA Response

- In 1996, FAA revised CRM Advisory Circular to include mention of “monitoring.”

Did this fix the problem?

King Air C90



NTSB



FedEx at Tallahassee, Florida

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



NTSB



October 25, 2002 Eveleth, Minnesota



G3, Nov. 22, 2004 Houston



Accident Summary

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



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.

FAA Response

- Monitoring skills and workload management are part of CRM and current CRM regulations adequately address these issues.

If so, why are these kinds of accidents still occurring?

However you say it...

- Definition of insanity: doing the same thing over and over again and expecting different results.
- Don't let the same thinking that got you into this problem get you out of it.
- If you always do what you've always done, you'll always get what you've always got.

Whatever has been done hasn't had widespread effects on improving monitoring.

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



Heading **247**°



Pedal ♦



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

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.”

NTSB Recommendation

- Require Part 121, 135, and 91K operators to review their SOPs 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.

LOSA data

- Roughly 64% of “unintentional errors” in the University of Texas LOSA archive were undetected by flight crew.
- In one U.S. airline’s LOSA, 19% of errors could have been eliminated by more effective crew monitoring and cross-checking.
- In that same LOSA, 69% of “undesired states” could have been eliminated by more effective monitoring.

**Can we agree that more should
be done to improve monitoring
and cross-checking?**

NTSB



FLIGHT SAFETY FOUNDATION
AUGUST-NOVEMBER 2000

FLIGHT SAFETY DIGEST

SPECIAL ISSUE

ALAR

Approach-and-landing Accident Reduction


Turboprop Propulsion System Malfunction



Recognition and Response

Controlled Flight Into Terrain

Education and Training Aid



Production: Volume 1, Section 1-4

Message from the President of ICAO

Volume 2, Section 5, Index

Disclaimer

Flight Safety Foundation

U.S. Department of Transportation Federal Aviation Administration

ALAR

Approach and Landing Accident Reduction Kit

AIRPLANE UPSET RECOVERY

Industry Solutions for Large, Swept-Wing Turboprop Airplanes Typically Seating More Than 100 Passengers

ABSAI, Inc.
A.M. Carter Associates
Fanhua Per Simulation & Training
Air Transport Association
Alcoa
Air Line Pilots Association
Alfa Airline
Alaska Airlines, Inc.
All Nippon Airways Co., Ltd.
Allied Pilots Association
Alma Airlines, Inc.
American Airlines, Inc.
American Trans Air, Inc.
AustraliAir
Bombardier Aerospace Training Center (Regional Jet Training Center)
British Airways
Cathay Pacific Airways Limited
Continental Airlines
Delta Air Lines, Inc.
Deutsche Lufthansa AG
EVA Airways Corporation
Federal Aviation Administration
Flight Safety International
Flight Safety Foundation
Hawaiian Airlines
International Air Transport Association
Japan Airlines Co., Ltd.
Lufthansa German Airlines
Midwest Express Airlines, Inc.
National Transportation Safety Board
Northwest Airlines, Inc.
Oneworld Airlines, Ltd.
SAS Flight Academy
Southwest Airlines
The Boeing Company
Tara Air Lines, Inc.
United Air Lines, Inc.
Royal Dornier Training Institute
US Airways, Inc.
Vertice

Page 2, November 2000

OFF

SAFETY TRAINING AID



U.S. Department of Transportation
Federal Aviation Administration

MONITORING AND CROSS-CHECKING TRAINING AID

- Air Line Pilots Association, International
- American Airlines
- Atlas Air
- Boeing
- Delta Air Lines
- Federal Aviation Administration
- FedEx Express
- jetBlue
- LOSA Collaborative
- National Aeronautics and Space Administration
- National Transportation Safety Board
- Southwest Airlines Pilots Association
- US Airways
- U.S. Navy



NTSB



One approach

- **Developing** well thought-out SOPs
- **Training** monitoring skills
- **Practicing** those skills

Developing Procedures



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

NTSB



Practicing



NTSB



Proper Monitoring

- Requires discipline
- Requires pilots to understand the value in it, or the necessity of doing it.



Actively monitor

- Pilots must “actively monitor” the aircraft.
- This means that they must mentally fly the aircraft, even when the autopilot or other pilot is flying.
 - Monitor the flight instruments just as you would when hand flying.
 - If the aircraft (or other pilot) is not doing what it is supposed to do, actions should be taken to rectify the situation.



NTSB



Strategically Planning Workload

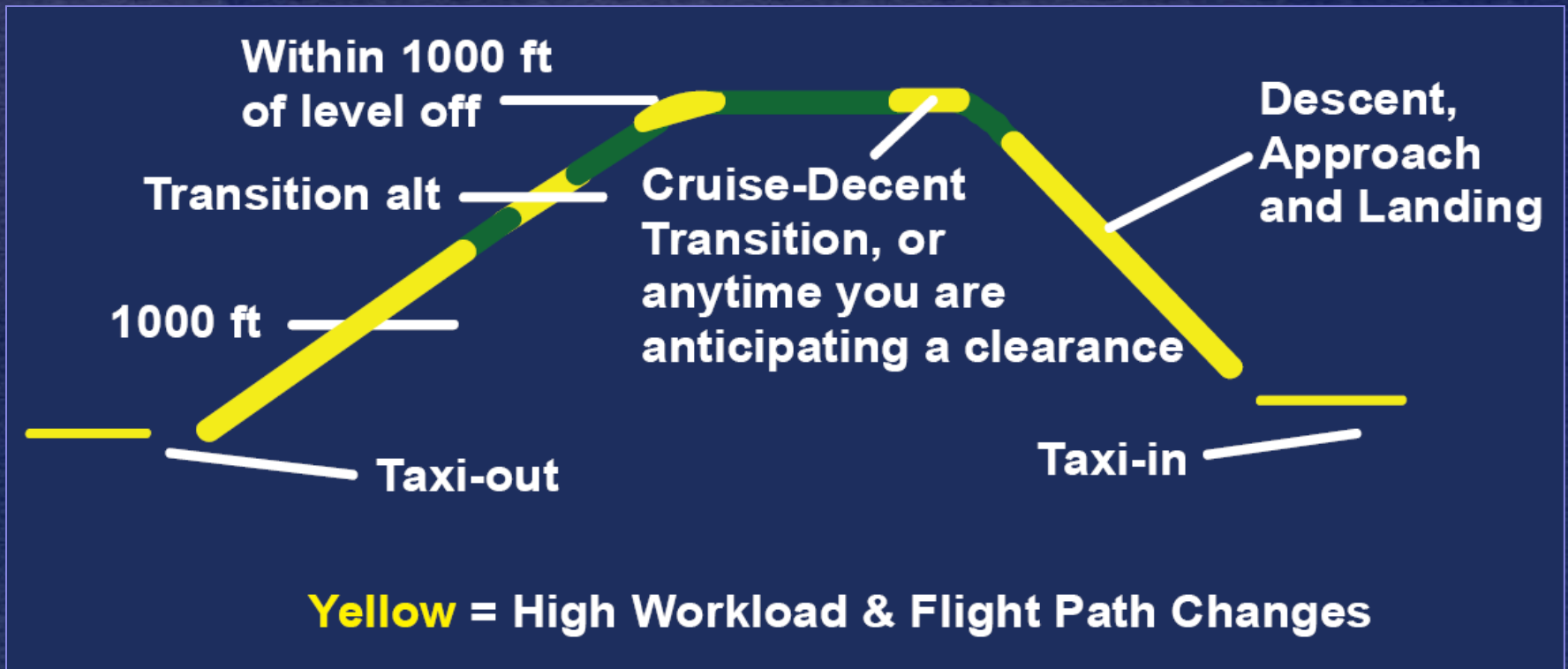
- In approximately one-third of the cases studied by researchers, pilots “failed to monitor errors, often because they had planned their own workload poorly and were doing something else at a critical time.”
 - Jentsch, Martin, Bowers (1997)
- “Doing the right thing at the wrong time.”
 - Steve Swauger
- Doing the wrong things at the wrong times.

Strategically Planning Workload

- Pilots should recognize those flight phases where poor monitoring can be most problematic.
- Strategically plan workload to maximize monitoring during those areas of vulnerability (AOV)
 - Examples of non-monitoring tasks that should be conducted during lower AOV include stowing charts, programming the FMS, getting ATIS, accomplishing approach briefing, PA announcements, non-essential conversation, etc.



Strategically Planning Tasks



- From US Airways

What is the road map for moving forward?

- Define scope of “monitoring”
 - Specifically, what are the crewmembers expected to monitor?
- Agree on scope of the project
 - What are we trying to accomplish?
 - What is the deliverable?
 - What is time frame?
 - How to get there?



NTSB