

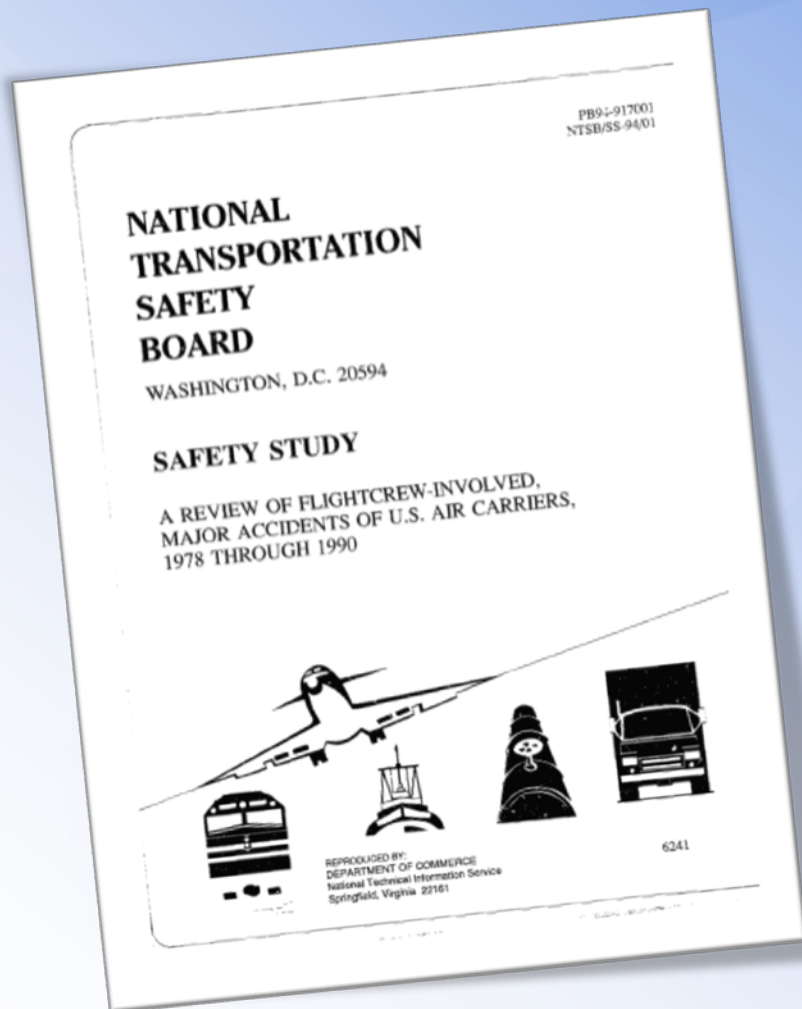
# **A Practical Guide for Improving Flight Path Monitoring**

**ASPA  
July 1, 2015**

**Helena Reidemar  
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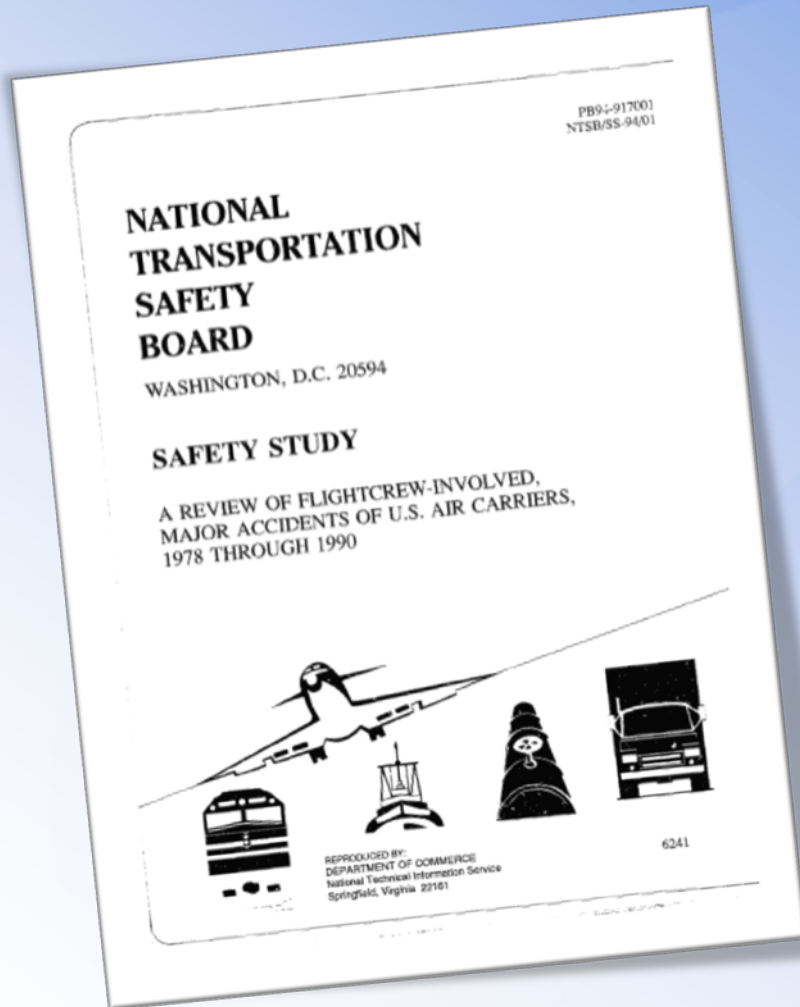


Inadequate crew monitoring or challenging was a factor in 31 of 37 (84 percent) reviewed accidents.



# 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



# Asiana Flight 214

## July 6, 2013

### San Francisco, California



## NTSB Finding

“Insufficient flight crew monitoring of airspeed indications during the approach likely resulted from expectancy, increased workload, fatigue, and automation reliance.”





# **UPS Flight 1354**

## **August 14, 2013**

### **Birmingham, AL**

## **NTSB Finding: Monitoring**

“The flight crew did not sufficiently monitor the airplane’s altitude during the approach and subsequently allowed the airplane to descend below the minimum altitude without having the runway environment in sight.”





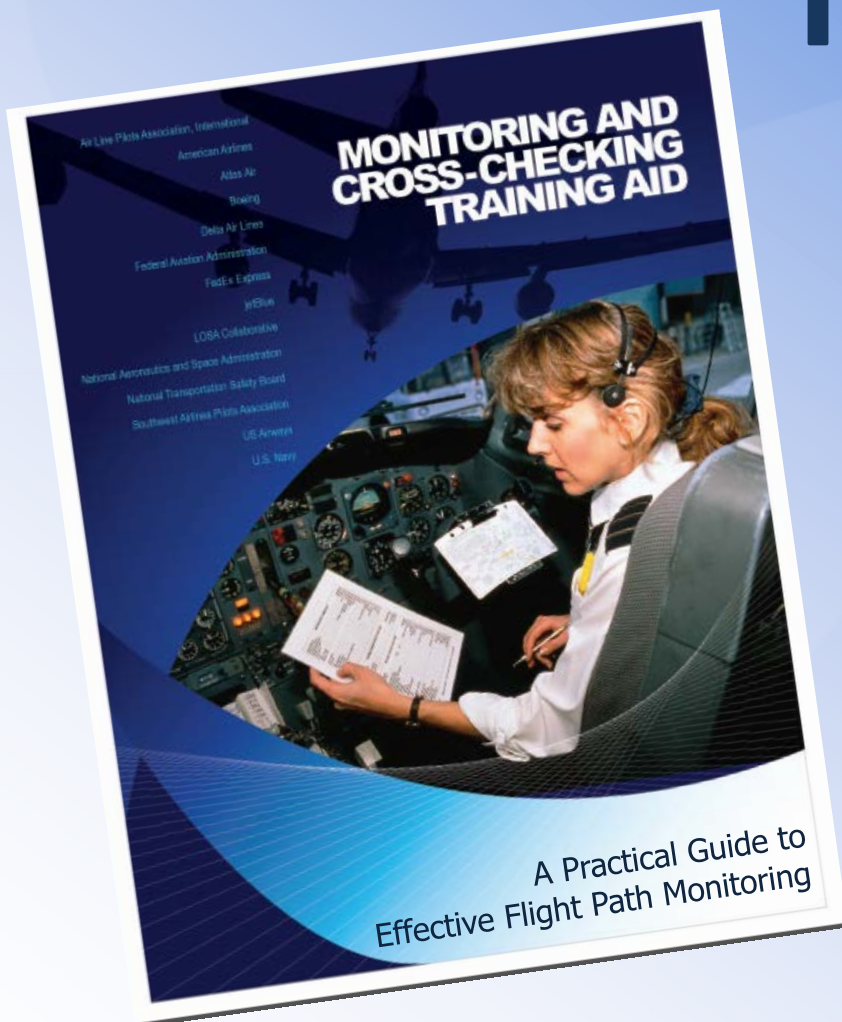
# A Practical Guide for Improving Flight Path Monitoring



The goal of this document  
is to provide practical ways to improve  
flight path monitoring.



# Participants



A4A

Airbus

ALPA

American Airlines

Delta Air Lines

FAA

FedEx

Flight Safety Foundation

IFALPA

jetBlue

LOSA Collaborative

NASA

NBAA

NTSB

RAA

Southwest Airlines Pilots Assn.

United Airlines

US Airways



# Timeline and Progress

- Dec 2012, Planning of PM project after 1st HF Roundtable
- Feb 2013, First WG meeting at Delta in ATL
- May 2013, Second WG meeting at WSU in DAY
- Oct 2013, Third WG meeting at NBAA in DC
- Feb 2014, Steve, Robert and Helena met with FSF for final publishing plans
- Nov 2014, Document was presented at Flight Safety Foundation IASS and made available to the public

# Paradigm shift



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

This will require addressing the 4 “P”s:

- Philosophy
- Policy
- Procedures
- Practices



# **A Practical Guide for Improving Flight Path Monitoring**

- Section 1: Overview for Management
- Section 2: Data
- Section 3: Barriers to Effective Monitoring
- Section 4: Recommendations for Improved Monitoring



# Section 1:

## Overview for Management

- The document is intended for those who develop SOPs and design and implement flight crew training programs.
- It is also intended for those who have responsibility for funding and endorsing training programs.





# **Section 2:**

## **Monitoring Data and Research**

- Aircraft Accidents
- Research
- LOSA Data
- ASAP



# **Section 3:**

## **Barriers to Effective Monitoring**

- HF Limitations
- Time Pressure
- Lack of Feedback
- Design of Flight Systems
- Pilots inadequate mental model
- Corporate Climate



# Bad News / Good News

## Bad News

Humans are not naturally good at monitoring highly reliable / highly automated systems over periods of time.

## Good News

Monitoring performance can be improved significantly by using the following procedures.



# Section 4:

## Recommendations for Improved Monitoring

- 20 Recommendations
- Tools and Examples of Good Practice
- Recommendation Categories
  - Monitoring practices
  - Procedures, Policies and Monitoring
  - Monitoring Autoflight Systems
  - Training and Evaluating Monitoring Skills





# Monitoring practices



# Institute Practices that Support Monitoring

- Briefings
- Specific Values
- Techniques / Cues / Triggers



# Clearly Define the Monitoring Role

- Task Allocation
- Definition of Pilot Flying (PF)
- Definition of Pilot Monitoring (PM)
- PM is more than Just Observing. It is an Active Role



# Areas of Vulnerability

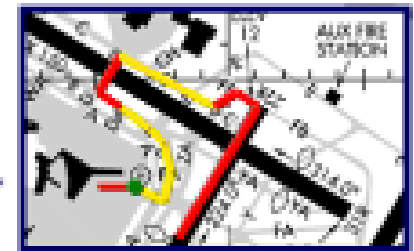
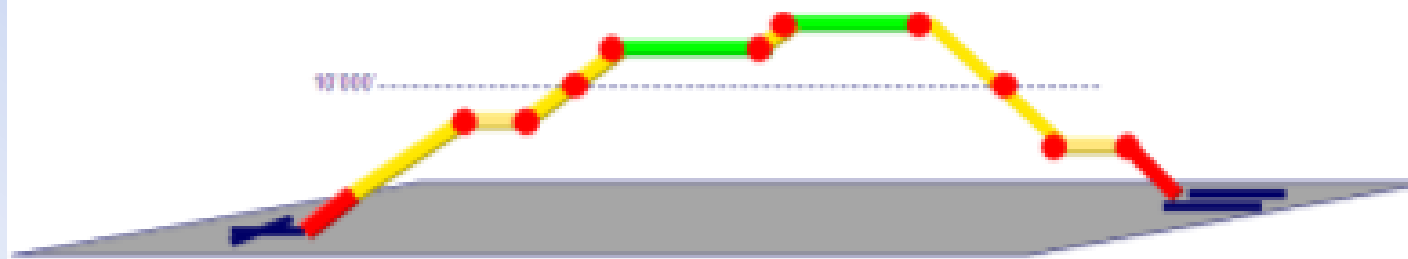
- Recognizing flight phases where crew is vulnerable to deviations.
- Defining Work Load Management Practices.





# Flight Path Monitoring

## Areas of Vulnerability



Level of Vulnerability	Definition		Desired FPM Behaviors	
	In Flight	On Ground	Sampling Rate	Workload Management
High	<ul style="list-style-type: none"> <li>• All changes of lateral or vertical trajectory, or speed</li> <li>• Last 1000' of climb/descent</li> <li>• All flight close to the ground</li> </ul>	<ul style="list-style-type: none"> <li>• Approaching, crossing, or entering a runway or tight space</li> </ul>	<ul style="list-style-type: none"> <li>• Highest</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid all tasks not related to flight path, if at all possible</li> <li>• Essential and time-critical tasks (not related to flight path) are done by PM.</li> </ul>
Medium	<ul style="list-style-type: none"> <li>• Climbs and Descents (especially climbs &amp; descents with constraints or when approaching a High AOV)</li> <li>• Flight below 10,000'</li> </ul>	<ul style="list-style-type: none"> <li>• All other ground movement</li> </ul>	<ul style="list-style-type: none"> <li>• Elevated</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid non-essential tasks</li> <li>• Essential, non-time-critical tasks (not related to flight path) are done by PM</li> </ul>
Low	<ul style="list-style-type: none"> <li>• Straight-and-Level cruise flight above 10,000'</li> </ul>	<ul style="list-style-type: none"> <li>• Stopped with parking brake set</li> </ul>	<ul style="list-style-type: none"> <li>• Normal</li> </ul>	<ul style="list-style-type: none"> <li>• Normal task management.</li> <li>• Tasks not related to flight path preferentially done by PM, if possible/practical.</li> </ul>

# Interventions to Maintain Effective Monitoring

- Dealing with Unanticipated Task Loading
- Malfunctions
- Rapid or Large Flight Energy Changes



# Practices that Protect Flight Path Management from Distractions and Interruptions

- PM makes FMS Entries during High AOVs
- Prohibit Conducting Checklists and Other Non-Critical Duties during Taxi in High AOVs



# Improved Monitoring of Altitude Changes

- Improve SOP's to Support Altitude Awareness
- Adopt Policy of Sterile Flight within 1,000 feet of Altitude Change





# Effect of Emergency and Non-Normal Situations on Monitoring

- Additional / Unexpected Workload
- Stress
  - Tunneling



# Procedures, Policies, and Monitoring



# **Review Current Operating Procedures for Conflict with Monitoring**

- Ambiguous Procedures
- Procedures that can Prevent Effective Monitoring
- Routine Repetitive Tasks
- Review Safety Data for Higher Occurrences of Error



# **Review Specific Monitoring-Related Procedures for Compliance**

- Go Around Compliance from Unstable Approaches
- Normalization of Deviance



# Analyze Corporate Messages

- Analyze Explicit and Implicit Messages
- Over-emphasizing On-Time and Fuel Savings





# Ensuring Common Understanding of ATC

- ATC Communications is Critical Task
- Practices to Enhance Compliance with ATC
- Require Both Pilots to Listen/Read to ATC Clearances



# Monitoring Autoflight Systems



# Monitoring and Cross Verification of Automation as Related to Flight Path Management

- Develop a Comprehensive Flight Path Management Policy
- Differentiate Between Guidance and Control
- Train Levels of Manual Flying not Levels of Automation



# Improve Training of Automated Systems

- Train Deeper Understanding Of How Automation Effects Flight Path Management
- Train for Failures or Degradations of Automation
- Training to Enhance Monitoring of FMS operations



# Training and Evaluating Monitoring Skills





# Train Pilots on Human Limitations of Monitoring

- Identify the Barriers
- Techniques and Tools to Overcome Limitations
- Recognize Poor Task Management



# Reinforce Need to Challenge Deviations

- Monitoring is Ineffective if Deviations are not Communicated
- Power Distance Index (PDI) and role in Monitoring
  - Overcoming PDI Through Training and Procedures



# Develop and Publish Monitoring Tasks, Training Objectives, and Proficiency Standards

- Improving Monitoring Skills through Training and Evaluation
  - Requires Instructor Training for Specific Expertise
- Clearly Define these Tasks, Objectives, and Standards
  - Ensure Training of Expected Behaviors



# Implement Comprehensive Approach to Auto Flight and Flight Path Monitoring

- Auto Flight and Flight Path Monitoring SOP's Emphasized during all Training
- Monitoring Skills emphasized as with Flying Skills
- Incorporate Auto Flight and Flight Path Monitoring events into CQ



# Incorporate Monitoring Training into Simulator Training

- Incorporate Monitoring in Pre-Sim Briefings, Training, and Post-Sim Debriefings
  - Not Embedded Training but Explicit Training





# Greater Emphasis on Monitoring in Flight Standards Programs

- Monitoring Emphasized to Stress its Importance
- Critique Monitoring during Debriefs of Checking Events
- Critique of Task Issues Coupled with Poor Monitoring Skills



# Summary

- Inadequate flight crew monitoring has been cited by a number of sources as a problem for aviation safety.
- While it is true that humans are not naturally good monitors, crew monitoring performance can be significantly improved.
- [Flightsafety.org/flightpath](https://flightsafety.org/flightpath)



# **Thank You**

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