2nd Annual Gulfstream Safety Standdown

NTSB National Transportation Safety Board

An NTSB Board Member's Perspective

Robert L. Sumwalt
December 7, 2009

From my perspective…

- Monitoring and Cross-checking
- Professionalism

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Monitoring and Cross-Checking

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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

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Raytheon Beechcraft A100

October 25, 2002 Eveleth, Minnesota

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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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Gulfstream G-III

- Nov. 22, 2004
- Part 91 positioning flight in IMC.
- Crashed approach to Houston Hobby Airport.
- 2 pilots and 1 flight attendant killed.

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Probable Cause

"the flight crew's failure to adequately monitor and cross check the flight instruments during the approach…"

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Flight Test Example

- Airbus A330, Chief Test Pilot
- June 30, 1994
- Preparation for certification of autopilot for Cat 3 landing weather minima
- Shortly after takeoff, autopilot was engaged, followed by simulated engine failure
- Pilots became involved with executing test plan, turning off hydraulic system
- Speed decay was not noticed, aircraft slowed 28 knots below Vmc

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Pueblo, CO

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

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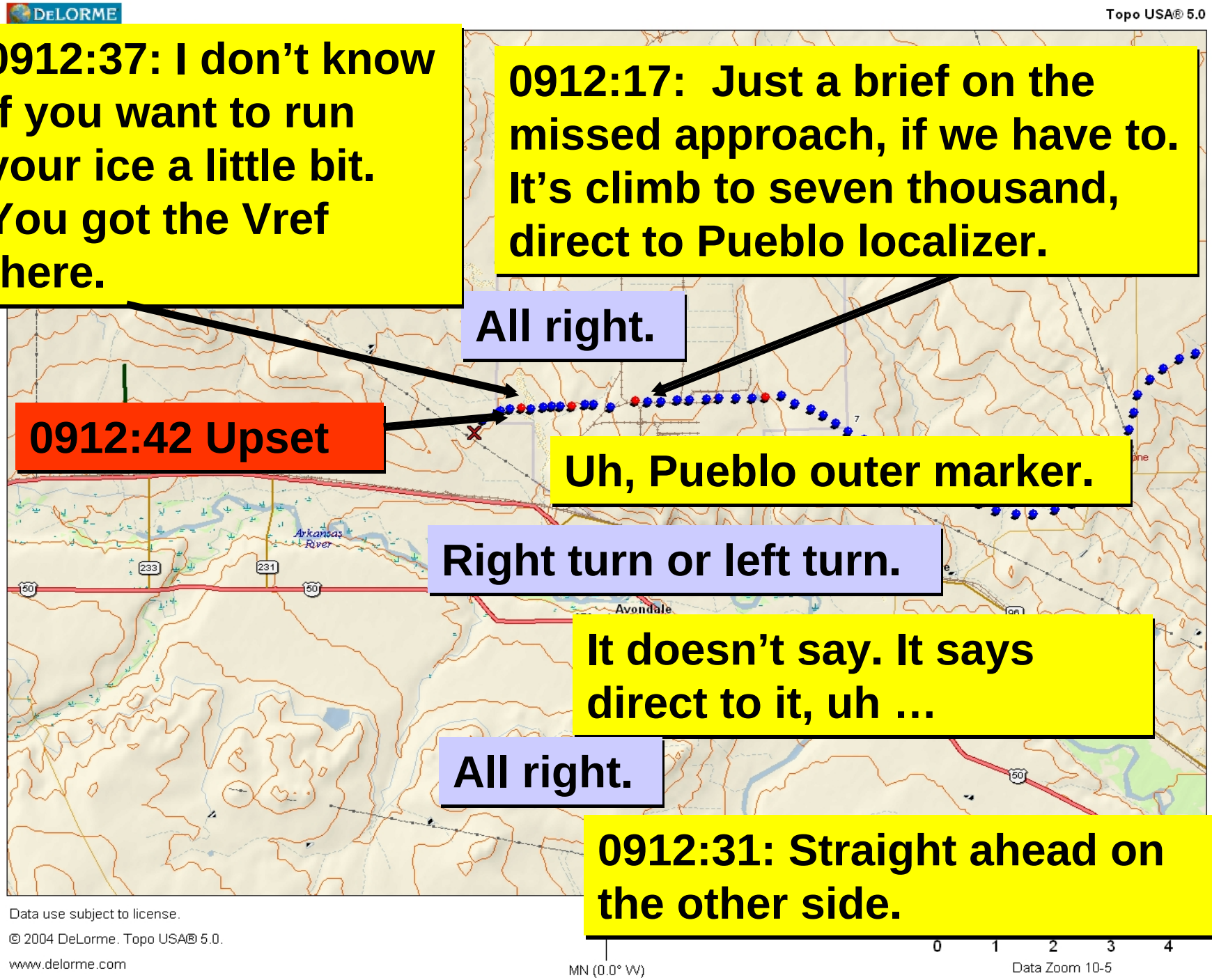
DeLORME
Topo USA® 5.0
0912:37: I don't know if you want to run your ice a little bit. You got the Vref there.
0912:17: Just a brief on the missed approach, if we have to. It's climb to seven thousand, direct to Pueblo localizer.
All right.
0912:42 Upset
Uh, Pueblo outer marker.
Right turn or left turn.
It doesn't say. It says direct to it, uh …
All right.
0912:31: Straight ahead on the other side.
Arkansas River
Avondale
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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 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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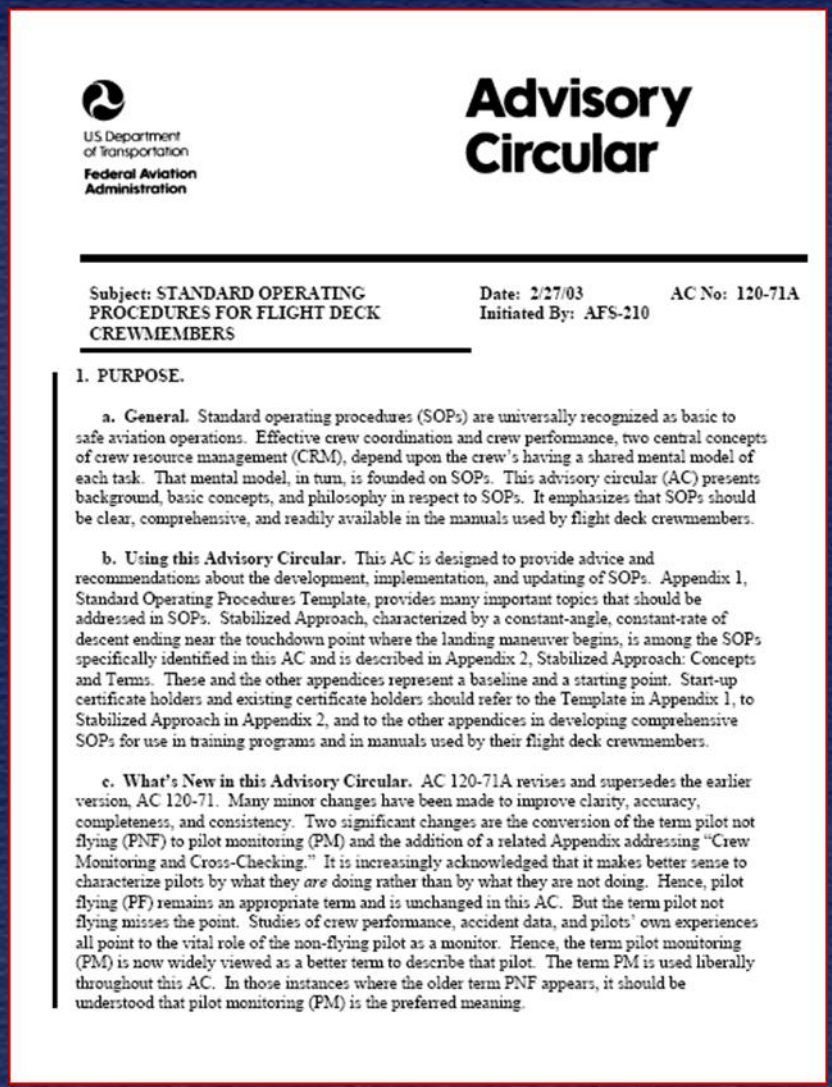
A good place to start



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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ASRS study significant findings

- 76 percent of monitoring errors occurred when aircraft was climbing, descending or on approach (“vertical flight phase”)

- 30 percent of the reports indicated that pilots were programming the FMS shortly before or during the monitoring error

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Practicing monitoring skills

- 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)

SOPs

- Change title of “Pilot-Not-Flying” (PNF) to “Pilot Monitoring” (PM)
  - Describes what the pilot should be doing (monitoring) versus what he/she is not doing (not flying)

SOPs

- **Both pilots** will have taxi charts available, when necessary
- **Both pilots** will monitor taxi clearance
- Captain will verbalize to FO any hold short instructions
  - FO will request confirmation from Captain if not received

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SOPs

- When approaching an entrance to an active runway, **both pilots** will ensure the hold short or crossing clearance is complied-with before continuing with non-monitoring tasks (FMS programming, ACARS, company radio calls, etc.)

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SOPs

- During high workload, FMS inputs will be made by PM, upon the request of PF.

  High workload examples

  – below 10,000 feet

  – within 1000 feet of level off or Transition Altitude.

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Practicing monitoring skills

- Pilots should recognize those flight phases where poor monitoring can be most problematic.
- Strategically plan workload to maximize monitoring during those areas of vulnerability
  - i.e., stowing charts, programming FMS, getting ATIS, accomplishing approach briefing, PA announcements, non-essential conversation, etc.

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Practicing monitoring skills

- By pre-briefing the approach in low workload periods, greater attention can be devoted to monitoring/cross-checking during descent.
- In fact, US Airways LOSA data showed that crews who briefed the approach after Top-Of-Descent (TOD) committed 1.6 times more errors during the descent/ approach/land flight phase than crews who briefed prior to TOD.

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Practicing monitoring skills

- One way of assessing your current monitoring ability is to ask: “How often do I miss making the 1,000’ to level-off altitude callout?”
  - When this callout is missed, chances are that you are not actively monitoring the aircraft.

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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The challenge

Take this concept home with you
and improve monitoring/cross-checking in Gulfstream operations.

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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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Professionalism

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Comair Airlines Flight 5191
Lexington, Kentucky

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

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Crew Actions

- Setting tone during preflight
  - Casual and relaxed
  - Abbreviated taxi briefing
- Noncompliance with sterile cockpit rule
  - 40 of the 150 seconds during taxi were violations of sterile cockpit rule
- Distraction likely contributed to loss of positional awareness

NTSB Finding

- “The flight crew’s noncompliance with standard operating procedures, including the captain’s abbreviated taxi briefing and both pilots’ nonpertinent conversation, most likely created an atmosphere in the cockpit that enabled the crew’s errors.”

Pinnacle Airlines Flight 3701
Jefferson City, Missouri

- October 14, 2004
- Bombardier CL-600-2B19
- Repositioning flight
- Both flight crewmembers killed

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What the investigation discovered

- Intentional activation of stall warning
- Swapping crew seats
- Rudder mishandling
- Climb to FL 410
  - “have a little fun”
- Automation mismanagement
- Airspeed loss, stall, loss of control, double engine failure
- Did not fully disclose real problem with ATC

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NTSB's Probable Cause

- "the pilots' unprofessional behavior, deviation from standard operating procedures, and poor airmanship, which resulted in an in-flight emergency from which they were unable to recover…"

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Corporate Airlines
dba American Connection Flight 5966
Kirksville, Missouri

- October 19,2004
- BAE J-32 (Jetstream)
- Crashed into trees on nighttime non-precision instrument approach
- 13 fatalities
- 2 serious injuries

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NTSB Finding

- “The pilots’ nonessential conversation below 10,000 feet MSL was contrary to established sterile cockpit regulations and reflected a demeanor and cockpit environment that fostered deviation from established standard procedures, crew resource management disciplines, division of duties, and professionalism, reducing the margin of safety well below acceptable limits during the accident approach and likely contributing to the pilots’ degraded performance.”

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A fine line

- “There is a fine line separating a relaxed and easy atmosphere in a cockpit from a lax one where distractions can result in critical failures.”
- “Professionalism may be described as knowing the difference between the two.”

  – Honorable John K. Lauber

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