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"LOSA Data and Emergency and Abnormal Situations"

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Agenda

- Safety Change & Training Development Program
  - A "Greater Level of Safety"

- Review of data from the Line Operations Safety Audit (LOSA) 2000
  - Emphasis on checklist usage, emergencies & abnormals
  - Review of several Aviation Safety Action Program (ASAP) events

Process For A Greater Level Of Safety

The Continental Airlines Safety Change & Training Development Program

Are We Really Safe?

- Safer than in the past?
- Not as Safe as we need to be?

How Do We Know?

- No one's been Killed in our operations.
- We haven't had a resent Major Accident.

SO WHAT!

The Wake-up

- Any Carrier can suffer a major accident at any time. We're only as safe as our last Accident.

- We must continue to investigate accidents so they are not repeated. But, we must also reduce accident precursors to eliminate future accidents.

- Remember, Things are happening in everyday, normal flight operations and -- we don't know about them!

- All flights are exposed to risk. The only sure way to avoid the risk of an accident is to not fly at all.

Because Flying *IS* our Business:

- System Threats must be identified and reduced/eliminated.

- Crew Errors must be avoided and managed.

- A Safety Measurement System must be used to identify "Targets" for improving the normal flight operation's safety margin.

In The Past - Safety Changes:

- Were made in response to
  – Accidents/incidents
  – FAR changes
  – FAA directives
  – NTSB accident investigations.

- Were made, based on the experience & intuition of Flight Operations Managers.

- Were not based on any current operational data concerning accident/incident <u>precursors</u>, because there was no data available.

- <u>***Were successful in achieving a very low accident rate.***</u>

Today's Safety Change Program

- Discovers "Targets" using safety data and analysis concerning accident PRECURSORS.

- Discovers the "What", "Why", "How" associated with safety events.

- Today's safety data tools include:
  - Flight Operations Quality Assurance (FOQA)
  - Line Operations Safety Audit (LOSA)
  - Aviation Safety Action Program (ASAP)
  - Continental Airlines Safety Information System (CASIS)
  - Advanced Qualification Program (AQP)

- Provides Flight Operations Managers additional insight required to improve upon the current accident rate.

Why LOSA, ASAP FOQA, etc?

"The essence of a good flight data analysis and reporting system is that it should be confidential and non-punitive. The concept is that it is better to know about a potential problem - so that it can be analyzed and the underlying reasons corrected in order to prevent its reoccurrence before it leads to something more serious - than to punish those that might have made an error, etc…"

-Flight Safety Foundation

November 2002

Is Data All We Need?

- No.

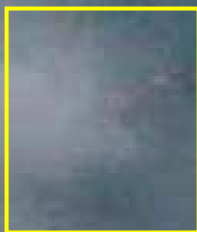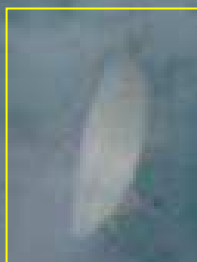- The new explosion in data collection has brought forward the "New Data Wave".

The New DATA WAVE

OH GOOD! -

THE DATA

ARE IN!!

Is Data All We Need?

- **No**. The new explosion in data collection has brought forward the New Data Wave.

- The data must be mined and analyzed to identify the Safety Targets

- The Safety Change Program then takes the targets and translates them into "Changes".

Data Driven - Safety Change & Training Development Program

- Measure (with **LOSA, FOQA, ASAP**) to obtain **Targets**
- Detailed **analysis** of targeted issues
- List of potential changes for improvement
- Risk analysis and **prioritization** of changes
- Selection and **funding** of changes
- Implementation of changes (**TRAINING DEVELOPMENT & ACTUAL TRAINING**)
- Time for changes to **stabilize while training is completed.**
- **Re-measure**

What Types Of Changes Are Made?

- Changes in operational philosophy, policies and procedures.

- Changes to the "System", the aircraft, hardware, software

- Changes to Threat & Error Management Strategies and Countermeasures. (Humanware)

The Safety Change & Training Development Program

- "Change" itself is a safety threat.

- An explanation of why the change was made improves acceptance.

- Change is more readily accepted when there are data to support the change.

- When "change" data & information **precede** the change, training to proficiency is achieved sooner.

Training Development

- Is meant to be proactive.

- Needs to be based on valid data (AQP).

- May require "thinking outside the box".

- Must be human centered and tested.

- Needs to be a continuous process.

Use of LOSA & ASAP Data in the Process For A Greater Level Of Safety

The Continental Airlines Safety Change & Training Development Program

LOSA – 2000

Line Operations Safety Audit Report

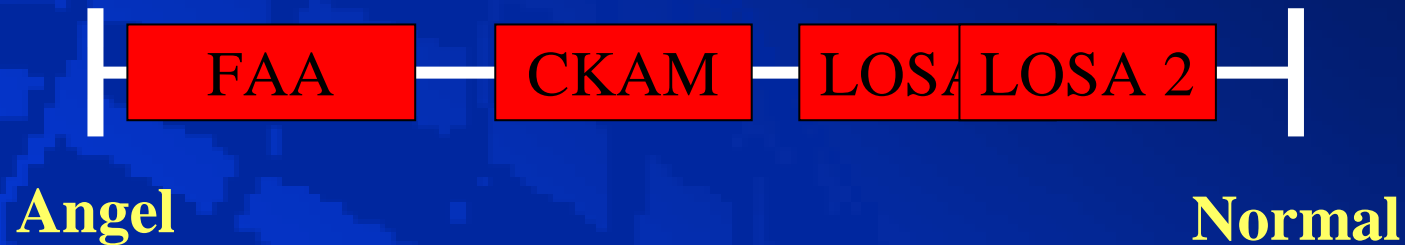SAFETY & REGULATORY COMPLIANCE

April 20, 2001

Why LOSA?

"An examination of *normal* operations should provide insight into the latent conditions that can become active chains if intervention is not made."

-Flight Safety Foundation

November 2002

"Normal" Performance

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|——[ FAA ]——[ CKAM ]——[ LOSA|LOSA 2 ]——|
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Angel   **Normal**

- Distance between "Angel" and "Normal performance varies as a function of culture, training, etc.
- LOSA enables us to get as closer to normal performance than was previously possible.

LOSA Demographics

- LOSA – 2000 project observations were accomplished between June and September 2000

Fleet	Crews observed	Segments observed
737	166	177
MD-80	64	65
757	54	62
777	32	36
DC-10	42	45
TOTAL	358 crews	385 segments

- **85% of the observations conducted by CO pilots**
  - CO observers logged more errors and showed no difference in their behavioral marker ratings when compared to UT observers

LOSA 2000

There were five parts to LOSA 2000:

- Part 1. Flight Crew Survey

- Part 2. Flight Crew Interview

- Part 3. Stabilized Approaches

- Part 4. CRM Counter-Measures

- Part 5. Threat and Error

Part 1:
Flight Crew Survey

Safety Culture

Comparing Safety Culture ratings across airlines, CO in 2000, scored the highest.

Safety Culture

In the cross-airline comparison charts that follow, you will find that the safety culture at CO is excellent.

Checklists

Satisfaction with checklists has decreased since 1996, and is due to the B737 fleet, where pilots expressed concern with the recent truncation of their normal checklists.

Stress and Emergencies

The following are some universally recommended strategies for handling stress in the cockpit:

- Monitoring self and others for signs of stress

- Cross-checking to ensure all crewmembers are focused and diligent

- Letting others know when you're becoming overloaded

- Letting others know when your performance is becoming impaired

- Buying some time (i.e. go-round) when time-pressured, to reduce the effects of tunnel   vision and rushing to ill-informed decisions

Stress and Emergencies

Relative to other airlines, CO 2000 pilots have healthy attitudes toward stress and recognizing the limitations of human beings. As mentioned earlier, it is important to recognize that all airlines are quite low on the stress scale of 0-100, where higher numbers indicate more realistic attitudes toward the effects of stress and fatigue and low scores indicate attitudes of vulnerability.

In general, CO 2000 pilots acknowledge the effects of stress, fatigue and personal problems on their performance.

Stress and Emergencies

Stress attitudes are fairly equally distributed between pilot subgroups. Pilots with a military background tended to have better stress recognition than those with a civilian flying background. Also, newer pilots were less realistic than older pilots. There were no differences by fleet, base, or position.

Stress and Emergencies

Past data from Co pilots shows a trend whereby personal invulnerability was decreasing from 1996 to 1999, but then in 2000 there appears to be a substantial increase in the "I'm bullet proof" belief. It is difficult to tell whether this shift is due to increased confidence that training has instilled in the crews, as crews become more skilled using CRM countermeasures to manage errors, or just an increase of over-confidence. While digging deeper into the data, a commitment must be made to ensure CO pilots understand that as the environment becomes more difficult (increasing numbers/severity of threats), stress builds and performance is likely to degrade. An attitude of vulnerability (AOV) concerning stress and decreased pilot performance will better serve the crew in managing threats and errors.

Part 2:
Flight Crew Interview

Checklists

The second most responded area of concern was Checklists. Understanding that all pilots will not agree on the correctness or usefulness of any one checklist, and pilots generally show some resistance when checklists change, this is not surprising. Looking at the responses by fleet type, the data show two fleets where the concern was higher than average (B-737 & DC-10).

Part 3:
Non-Conforming Approaches
(Unstable Approaches)

Part 4:
CRM Counter-Measures

Threat and Error Countermeasures

- Research indicates that CRM skills are best defined as threat and error countermeasures

- Four categories of threat and error countermeasures

    1. *Team Climate*

        – *Leadership, communication environment, and flight attendant briefing*

    2. *Planning*

        - *SOP briefings, plans stated, workload assignment, and contingency management*

    3. *Execution*

        - *Monitor / cross check, workload management, vigilance, and automation management*

    4. *Review and Modify*

        - *Evaluation of plans, inquiry, and assertiveness*

Part 5:
Threats & Errors

Threat Management Results

- **<u>Threats</u> – Events or external errors that originate outside the influence of the flight crew but require their attention to maintain safety**

<u>Environmental Threats</u>
- *Adverse WX*
- *Terrain*
- *Airport Conditions*
- *Heavy traffic / TCAS events*

<u>ATC Threats</u>
- *Command events / errors*
- *Language difficulties*

<u>Aircraft Threats</u>
- *Malfunctions*
- *Automation events*

<u>Crew Support Threats</u>
- *Dispatch events / errors*
- *Ground events / errors*
- *MX events / errors*

<u>Operational Threats</u>
- *Time Pressures*
- *Irregular Operations*
- *Radio congestion / poor reception*

<u>Cabin Threats</u>
- *Cabin events / FA errors*

Video

"Jim Jim"

Building a Threat Profile

- Threat profile
  - What is the operation's exposure to certain types of threats?
  - What kind of threats are most typically mismanaged?
- Exposure - Top Three Threats
  1. Adverse WX
  2. ATC command events / controller errors
  3. A/C malfunctions
- Management - Top Three Mismanaged Threats
  1. Radio congestion / poor reception (only 1 pilot listening)
  2. ATC command events / controller errors
  3. A/C malfunctions

THREATS MIS-MANAGED

•The mis-managed aircraft malfunction threats involved minor failures that are routinely handled well in the simulator, but in the aircraft, appeared to cause a startle effect that had all pilots working the problem (without the checklist), and no one flying the aircraft.

Threat Management Results by Fleet

Statistically, the variance between fleets concerning threats and threat management, was not a significant factor. The data presented here are just to show that there are differences, even if they are small.

Flight Crew Error Types

1. <u>Intentional Noncompliance</u> – Regulatory or SOP violations

    Ex) Performing several checklists from memory

2. <u>Procedural</u> – Followed procedures with incorrect execution

    Ex) Wrong attitude setting dialed

3. <u>Communication</u> – Missing information or misinterpretation

    Ex) Miscommunication with ATC

4. <u>Proficiency</u> – Error due to the lack of knowledge or skill

    Ex) Lack of knowledge with automation

5. <u>Decision</u> – Crew decision unbounded by procedures that unnecessarily increased risk

    Ex) Unnecessary navigation through adverse weather

LOSA 1996 vs. 2000 Checklist Errors

LOSA 2000 indicated a significant drop in protocol checklist errors while unintentional checklist errors have remained unchanged

ASAP Events

Targets For Change

Targets for change:

Major Areas:

- ATC
- Airports
- Automation
- Aircraft malfunctions & procedures
- Communications & information
- Captain upgrade
- Unstable approaches
- LOSA observer training
- Threat & error management
- Change process

Aircraft malfunctions and procedures:

The data show minor aircraft system malfunctions resulted in a numerous aircraft threats to the crews. These threats were not of an extreme nature, yet the crews' diagnosis and handling of the event require further investigation.

Relatively simple abnormals, that are routinely handled well in the simulator, were not handled well on the line. Air-conditioning/pressurization, flaps, & gear and other problems were worked by the crew in several different ways:

- No QRH or checklist procedure identified or used

- QRH/checklist used, but both crew members working the problem - no-one "flying"

- Letting the "threat" (minor malfunction) become a distraction/interruption develop into a loss of situation awareness.

Threat and Error Management

LOSA 2000 Action Items

- Training on proper use of all checklists
  - Importance of using the QRH
- Redesign of checklists/QRH where necessary
  - Reduction of memory items
- Identify an emergency/abnormal as a "threat" and develop appropriate "strategies" to manage the "threat"
  - Who flies and who manages (PF, PM)
  - Prioritize tasks
- Continued work on decision-making skills
  - Skill, rule & knowledge-based
  - Creative problem solving