Threat and Error Management,
Line Operations Safety Audit

y

Normal Operations Safety Survey:
La perspectiva de la OACI

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Learning from Failure & Success

System design → Baseline performance

Operational deployment

Baseline performance → Operational performance

Operational drift
Capturing the Drift

- **Reactive systems**
  - Accident investigation
  - Incident investigation

- **Proactive systems**
  - Mandatory reporting systems
  - Voluntary self-reporting systems
  - Confidential reporting systems

- **Predictive systems**
  - Electronic safety data acquisition systems
  - Direct observation safety data acquisition systems
  - LOSA & NOSS
Safety Data Systems and Levels of Intervention

Baseline performance

Safety management levels

High
Middle
Low

Predictive
Proactive
Reactive

Operational performance

Hazards

Desirable management level

Highly efficient
Very efficient
Efficient
Insufficient

“Practical drift”
TEM, LOSA & NOSS – Similar is not the Same

➢ TEM = Framework – What we look for

✓ Hazards in operational contexts – Threats

✓ Potential consequence (s) of the hazards in operational contexts – Operational Errors

✓ Safety risk (s) of the potential consequence (s) of the hazards in operational contexts – Undesired States

➢ LOSA & NOSS = Tools – How we collect what we look for
**Threats**

Events or errors that occur **beyond the influence** of the flight crew/ATCO, **increase operational complexity**, and which must be **managed** to maintain the margins of safety.

- Not flight crew/ATCO errors
- Not *(necessarily)* deficiencies in the system
- **Errors by third parties** *(external errors)* are classified as threats to the focus group
  - Must be managed by the flight crew/ATCO to maintain existing margins of safety
Threats – Flight Deck

- Cabin crew errors
- Weather
- Maintenance errors
- Ground crew errors
- Heavy traffic
- Unfamiliar airports
- Distractions
- Passenger events
- ATC errors
- Terrain
- Similar call signs
- Time pressures
- Flight diversions
- System malfunctions
- Automation events
- Missed approaches
Threats – ATC

- Threats
- Similar call signs
- Reduced separation minima
- Airspace restrictions
- Runway crossings
- System malfunctions
- Missed approaches
- Communication failure
- Runway inspections
- Similar call signs
- Reduced separation minima
- Airspace restrictions
- Runway crossings
- Noise restrictions
- Heavy traffic
- Airspace reclassification
- Flight crew errors
- Maintenance errors
- SIRO
- LAHSO
Errors

Actions or inactions by the Flight Crew/ATCO that lead to deviations from organizational or Flight Crew/ATCO expectations

- **Equipment handling errors** – incorrect interactions with the equipment
  
  e.g. selecting an inappropriate radar source; making incorrect inputs to an automated system

- **Procedural errors** – deficiencies in execution
  
  e.g. wrong separation minima applied; leaving the position before replacement is ready to take over

- **Communication errors** – deficiencies in the exchange of operational information
  
  e.g. missed calls; misinterpretation of a request
Errors – Flight Crew

- **Handling errors** – deficiencies in stick and rudder skills
  - e.g. inability to maintain proper speed/configuration during ILS approach

- **Procedural errors** – deficiencies in execution
  - e.g. correctly selecting an incorrect altitude in the altitude alerter

- **Communication errors** – deficiencies in the exchange of operational information
  - e.g. misunderstanding an altitude clearance
Undesired Aircraft States

Flight crew induced aircraft states where risk is increased and existing safety margins are reduced

- Lateral deviation
- Vertical deviation
- Speed too high
- Speed too low
- Incorrect aircraft configuration
- Unstable approach

Outcomes

- Reportable events
- Incidents
- Accidents
Undesired States

Operational conditions where an unintended traffic situation results in a reduction of safety margins

- Aircraft climbing to a wrong altitude
- Aircraft turning in the wrong direction
- Aircraft enters a wrong taxiway
- Aircraft missing a crossing restriction
- ...

Outcomes

- Reportable events
- Incidents
- Accidents
As of 23 November 2006

Annex 1 – Personnel Licensing

- TEM training – Licensing requirement for all pilot and ATCO licenses (Standard)

Annex 6 – Operation of Aircraft

- TEM training – requirement for flight crew training, initial and recurrent (Standard)

Annex 6, Annex 11 & Annex 14

- Safety management requirements
  - The ICAO SMS course (www.icao.int/anb/safetymanagement)
  - ICAO Safety Management Manual (Doc 9859)
  - TEM, LOSA & NOSS