

# PROCEDURES IN CONTEXT

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# WHERE PROCEDURES FAIL: LEARNING FROM INVESTIGATION

- A reminder of the scope of the outstanding task as we complete the transition to safety by SOPs.
- Illustrative examples from some ICAO Annex 13 investigations where SOPs failed to deliver
- Pilot SOPs but with transferable principles.
- Sharing lessons learned from investigation is key

# WHAT IS 'A PROCEDURE' ?

- Any memory or easily-referenced normal or non normal operating procedure.
- This includes the FCOM and what appears in hard copy Checklists or on the ECAM/EICAS display.
- SOP standardisation has overwhelmingly driven by aircraft manufacture recognition that it's in their interests to concern themselves with operations not just airworthiness.



# SOP RESPONSIBILITY

- The **Aircraft Operator** for:
  - SOP existence, effective documentation and training.
  - Effectively monitoring of SOP compliance and addressing deficiencies.
- The **Safety Regulator** for effective oversight of aircraft operators' procedures.
- The **Aircraft Manufacturer / OEM** for defining procedures for default use by their operators.

# WHAT HAVE WE LEARNED FROM THE 737 MAX ACCIDENTS?

- Aircraft type certification relies less on the nominal oversight of safety regulators and more on the expert judgements of aircraft manufacturers.
- That principle extends to the formulation of procedures, most critically to non normal procedures.
- And especially to those where the window for an effective response is short, the circumstances confusing and only the commander has significant aircraft type experience.



# SOME RELEVANT FINDINGS FROM ANOTHER RECENT ANALYSIS

- In global fatal accidents over past 10 years:
  - Inadequately defined or trained SOPs were a factor in almost all accidents analysed.
  - Inadequate risk assessment for the definition and content of procedures and inadequate awareness of procedural compliance rates were widespread too.
  - Procedural non-compliance often appeared to be a consequence of inadequate understanding of the rationale for them.
  - The trend has been for the an increase in fatal accidents where non compliance with normal procedures led directly to non compliance with non-normal procedures - a 'domino effect'?

# WAYS PROCEDURES FAIL TO DELIVER

- Procedure available - unintended non compliance (UNC)
- Procedure available - intentional non compliance (INC)
- Inadequately defined procedures (IDP)
- Inadequately trained procedures (ITP)
- Inappropriately presented procedures (IPP)
- No effective procedure (NEP)



# PROCEDURE AVAILABLE (UNC)

## **B773 Dubai UAE 2016**

- An unsuccessful attempt to initiate a go around from the runway after forgetting that setting thrust requires physical movement of the thrust levers.

## **B738 Belfast International 2017**

- Takeoff thrust was too low because it was based on the expected top of climb temperature instead of the surface temperature after an unnoticed input error. A previously available SB providing automatic validation of the OAT input was available



# PROCEDURE AVAILABLE (UNC)

## A320 Liverpool 2018

- The Captain selected the flaps/slats up instead of the gear on hearing the "gear up" call . The pilot involved said in future they will "pause for longer before lever movement".

## DH8D Belfast City 2018

- The aircraft departed with the selected altitude at zero and neither pilot noticed the descent which followed autopilot engagement until the EGPWS 'PULL UP'.

# PROCEDURE AVAILABLE (INC)

## A333 Kathmandu 2015

- A non precision approach was continued below MDA with the autopilot still engaged and without challenge despite no visual reference. The autopilot was disconnected at 14 ft agl as the runway "appeared" and touchdown a few seconds later was completed on the grass.

## A343 Paris CDG 2012

- An ILS Cat 3 approach was continued significantly above the ILS GS and when a false upper GS lobe was captured 2nm out, complete loss of control almost occurred - an auto go around was initiated overhead the runway.]



# PROCEDURE AVAILABLE (INC)

## AT43 Indonesia 2015

- Terrain impact occurred in IMC during descent. The operator this and other Captains routinely disabled the EGPWS to preclude nuisance warnings. The prescribed visual descent/approach procedure was ignored and regulatory oversight of the operator was found ineffective.

## A320 Hiroshima Japan

- The Captain continued a night RNAV(GNSS) approach below MDA without the prescribed visual reference or challenge. An undershoot touchdown followed. The First Officer's lack of assertiveness was attributed to "the manner in which the Captain exercised his command".



# **PROCEDURE AVAILABLE (INC)**

## **B738 Christchurch NZ 2011**

- An ILS approach on a Captain's annual Line Check was continued through the DA without any visual reference and the aircraft was not visible to ATC until abeam the TWR after landing. The operator was aware of the Captain's habitual non compliance but had not effectively addressed the problem over a significant period.

## **A320 Halifax Canada 2015**

- A night approach non-precision approach was continued below MDA with the autopilot not disconnected until the aircraft was 30 ft agl after which an undershoot occurred. A violation of company procedures, an AFM limitation and applicable State Regulations.

# INADEQUATELY DEFINED PROCEDURES (IDP)

## A320 Halifax 2015

- A night non precision approach was continued through MDA as the crew considered that the required visual reference to continue existed but an undershoot resulted leading to a subsequent hull loss eventually resulted. The available SOP responses to the minimums call were not properly defined.
- All Company localiser-only approach minima were found to be the same regardless of the type of approach lighting system based on applicable State regulations.



# INADEQUATELY DEFINED PROCEDURES (IDP)

## **B738 Sint Maarten Eastern Caribbean 2017**

- Descent below MDA without valid visual reference and at an excessive rate led to an EGPWS 'TOO LOW TERRAIN' Alert but a go around was not initiated until 40 feet above the sea surface. The day-VMC option of continuing after an EGPWS Alert was permitted in company procedures but the corresponding OEM (Honeywell-2011) procedure was to climb. Operator (2015) & aircraft manufacturer (Boeing-2016) procedures had not been updated.



# INADEQUATELY TRAINED PROCEDURES (ITP)

## **B744 southeast of Hong Kong 2017**

- An experienced crew overlooked the need to increase airspeed when instructed to hold at a higher level than planned for and when the SPS activated, repeated failures to follow the SOP led to PIOs which and an upset with cabin crew and pax injuries. Related operator "crew training and guidance" were faulted.

# INADEQUATELY TRAINED PROCEDURES (ITP)

## A306 New York 2001

- "Unnecessary and excessive rudder pedal inputs" by the First Officer in "mild wake turbulence" led to separation of the vertical stabiliser and immediate loss of control. The airline's "Advanced Aircraft Manoeuvring Program" was flawed and the aircraft type involved was "particularly susceptible" to such inappropriately aggressive control inputs.



# INAPPROPRIATELY PRESENTED PROCEDURES (IPP)

## A320 near Perth Australia 2015

- Contamination caused by blockages randomly affecting all three pitot systems led to intermittent periods of conflicting airspeed display. Crew response was compromised as a result of inappropriate priority in the presentation of multiple ECAM alerts and indirectly by the content of the most important procedure once it appeared on the ECAM (a stall warning was ignored). Manufacturer revision of both related SOPs and ECAM display priorities followed.



# NO EFFECTIVE PROCEDURE (NEP)

## **B738 near Perth Australia 2017**

- Control column back pressure was applied to de-clutch the autopilot to adjust pitch with CWS but an unexpected autopilot disconnection was followed by an instinctively sharp manual reversal which caused cabin crew injuries. The crew initial action was undocumented “common practice” and had thus not been considered prior to an autopilot mod which invalidated it.

## **B738 Rome Ciampino 2008**

- When a go around was attempted after a major bird strike on short final, both engines failed simultaneously as thrust was increased. The Operator had not provided any procedure or guidance for this scenario.

# NO EFFECTIVE PROCEDURE (NEP)

## **B77L Paris CDG 2015**

- Takeoff with thrust set for a TOW 100 tonnes too low led to premature rotation. A prompt from an augmenting crew member to increase thrust enabled climb to begin. Operator takeoff performance calculation procedures were not robust and had not identified a gross error.

## **A320 Halifax 2015**

- Operator SOP for a non-precision approach in FPA mode did not require the aircraft altitude and distance from the threshold to be monitored or for any adjustments to be made to the FPA. This SOP was contrary to both the Company & Airbus FCOM and the Regulator had not identified the discrepancy when approving the OM/SOPs.



# TWO EXAMPLES OF THE POSSIBLE DOMINO EFFECT?

## **B738 Amsterdam 2009**

- After not commencing a go around when the auto ILS approach became unstable, a pilot on command upgrade line training then did not respond promptly with the required and trained SOP when the SPS was activated and loss of control and terrain impact followed.

## **B733 Kosrae Micronesia 2015**

- After QNH was not set prior to a night IMC approach, successive EGPWS terrain proximity alerts were initially assumed false and when a go around was eventually initiated due lack of visual reference at MDA, insufficient thrust was applied and a further EGPWS alert occurred.



# CONCLUSIONS

- The best possible set of SOPs with full compliance supported by appropriate training is a key contributor to operational safety and must be a priority for all those involved.
- A comprehensive understanding of **why** operating procedures exist and are presented the way they are not only supports compliance but equips front line personnel for occasional situations where the available procedures may not be the best response.
- Learning from experience within an operator, however big, is not enough. Awareness of the experiences of others is vital. The regularly updated collection of investigation reports and summaries of them in the **SKYbrary Accident and Incident Library** is a useful one-stop source.