Managing Non-Normals in Integrated Systems

Presented by Captain Brian Sanderson, 787 Technical Pilot

787
DREAMLINER
BOEING

Situation: Normal

Situation: Non-Normal

Situation: Non-Normal

141
TO/GA
LNAV
TO/GA
VNAV
9000
FMC
FLT DIR
80
60
30
800
600
200
-6
L 29.92 IN

141
HOLD
TO/GA
LNAV
ALT
VNAV
9000
FMC
FLT DIR
180
160
120
100
80
800
600
200
-4
L 29.92 IN

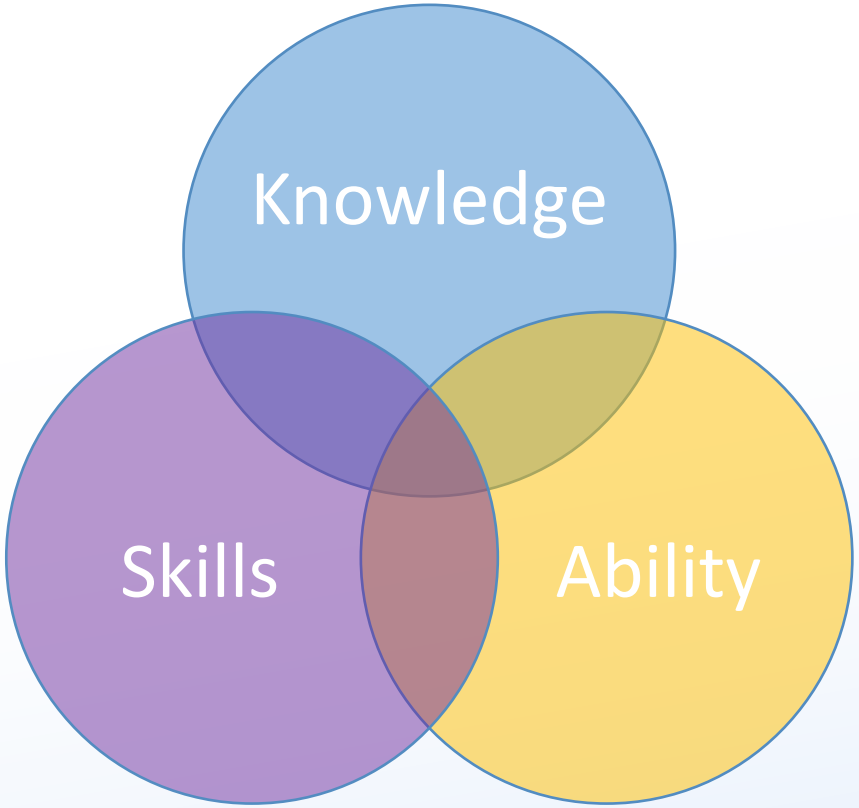
Situation: ?

FLT = B78701
MIC
XPDR 7777
SELCAL AA-AA
TAIL = N787BA1

UTC TIME	DATE	ELAPSED TIME
19:01:44z	14 OCT 09	01:11

Situation: ?

Basic Crew Assumptions



- CRM/TEM
- Operating Philosophy
- Airplane Systems
- System State Awareness
- Flight Path Management

"Shared Mental Model"

What is available as an initial response?
Step Down Automation?
Mode Change?
Alternate Data Entry?
Recovery Maneuver?
Immediate Actions?

Option Selections

Response Skills

Technical Skills

Non-Technical Skills (CRM/TEM)

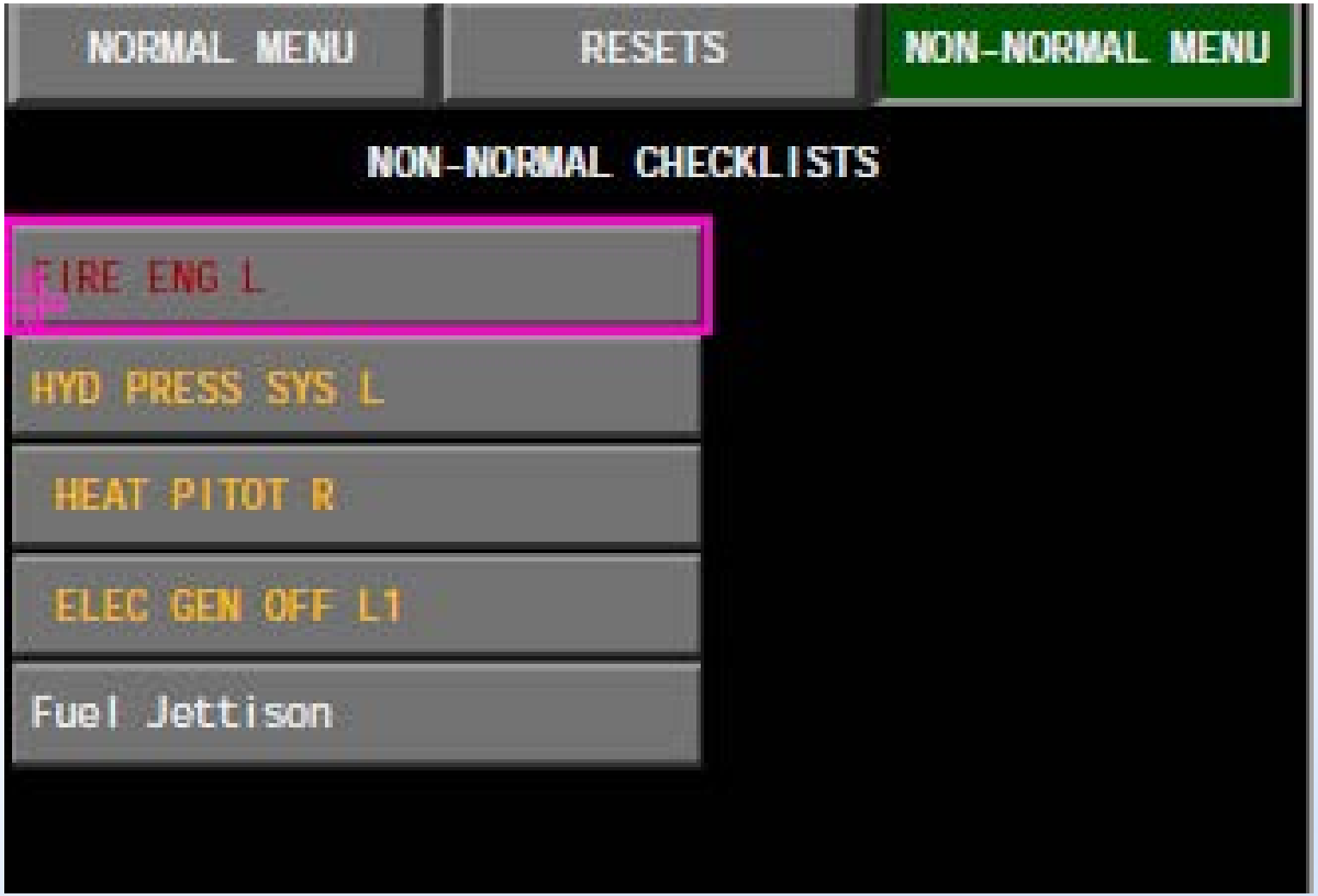
Resilience - Behaviors

Rules
Procedures
Knowledge

“Thinking Outside the Boxes”

Checklist Prioritization

Apply “Critical Thinking”



What to do first?

	AUTOTHROTTLE DISC
☐	FUEL JETTISON SYS
☐	FUEL JETTISON MAIN
☐	FUEL AUTO JETTISON
	NO LAND 3
☐	PACK L
☐	ENG EEC MODE L, R
☐	ENG EEC MODE L
☐	ENG CORE ANTI-ICE L
☐	WINDOW HEAT L FWD
☐	WINDOW HEAT R SIDE
☐	HEAT PITOT L
☐	ICE DETECTORS
☐	AUTOTHROTTLE L
	FUEL JETT NOZZLE L
☐	FUEL PUMP CENTER L
☐	FUEL BALANCE SYS
☐	FUEL IMBALANCE
☐	FUEL CROSSFEED
☐	AUTO SPEEDBRAKE
	TRANSPONDER
☐	TRANSPONDER PANEL
	TCAS
	SATCOM
	DATALINK LOST
	WEATHER RADAR SYS
☐	WINDSHEAR SYS
☐	THRUST ASYM PROT
	HUD SYS CAPT
	CARGO A/C FWD

We can’t write procedures for everything

FCOM – QRH Checklist Instructions

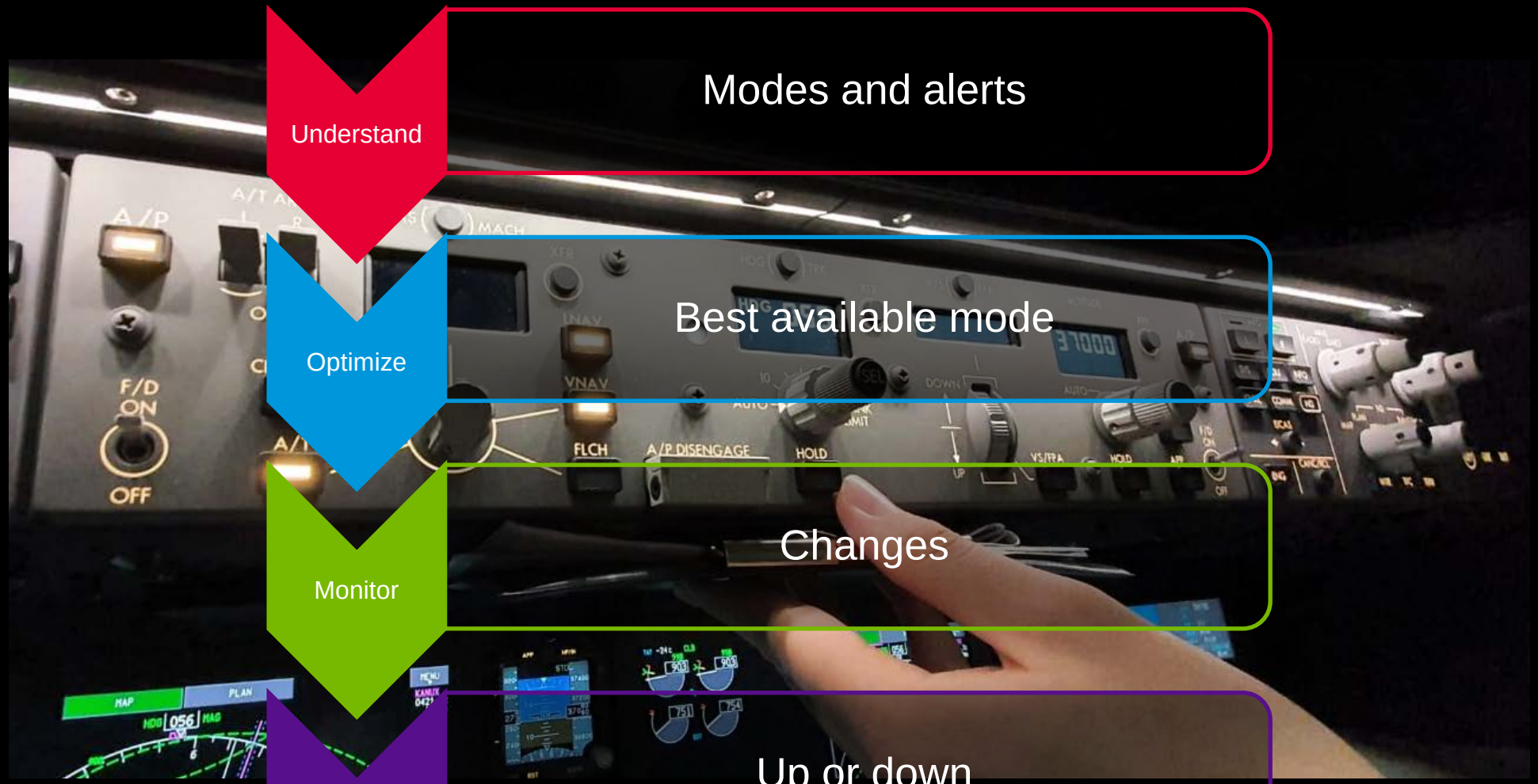
While every attempt is made to supply needed non–normal checklists, it is not possible to develop checklists for all conceivable situations. In some smoke, fire, or fumes situations, the flight crew may need to move between the Smoke, Fire or Fumes checklist and the Smoke or Fumes Removal checklist. In some multiple failure situations, the flight crew may need to combine the elements of more than one checklist. In all situations, the captain must assess the situation and use good judgment to determine the safest course of action.

Flight Crew Training Manual

Situations Beyond the Scope of Non-Normal Checklists

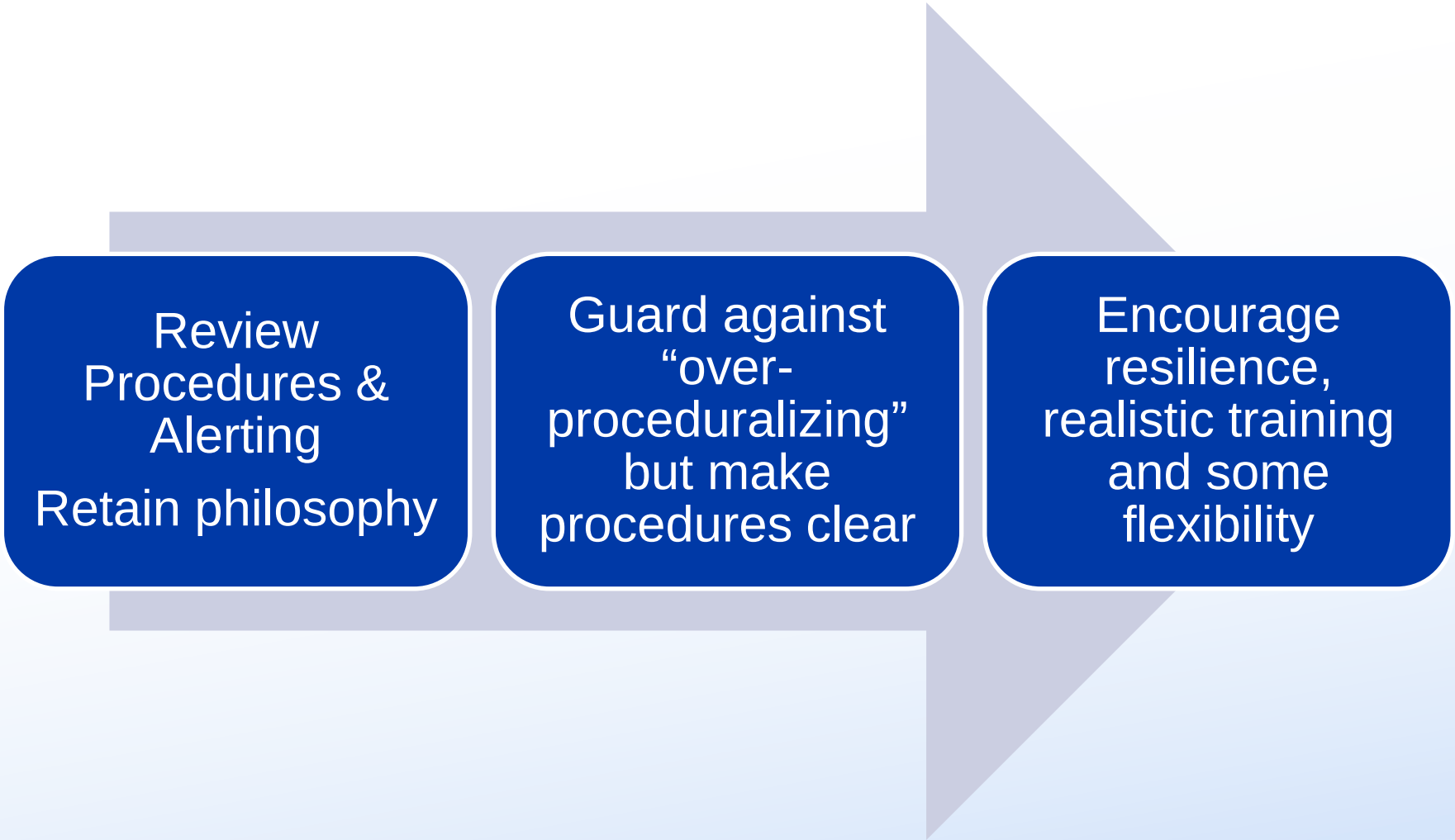
It is rare to encounter in-flight events which are beyond the scope of the Boeing recommended NNCs. These events can arise as a result of unusual occurrences such as a midair collision, bomb explosion or other major malfunction. In these situations the flight crew may be required to accomplish multiple NNCs, selected elements of several different NNCs applied as necessary to fit the situation, or be faced with little or no specific guidance except their own judgment and experience. Because these situations are rare, it is not practical or possible to create definitive flight crew NNCs to cover all events.

Automation & Mode Awareness

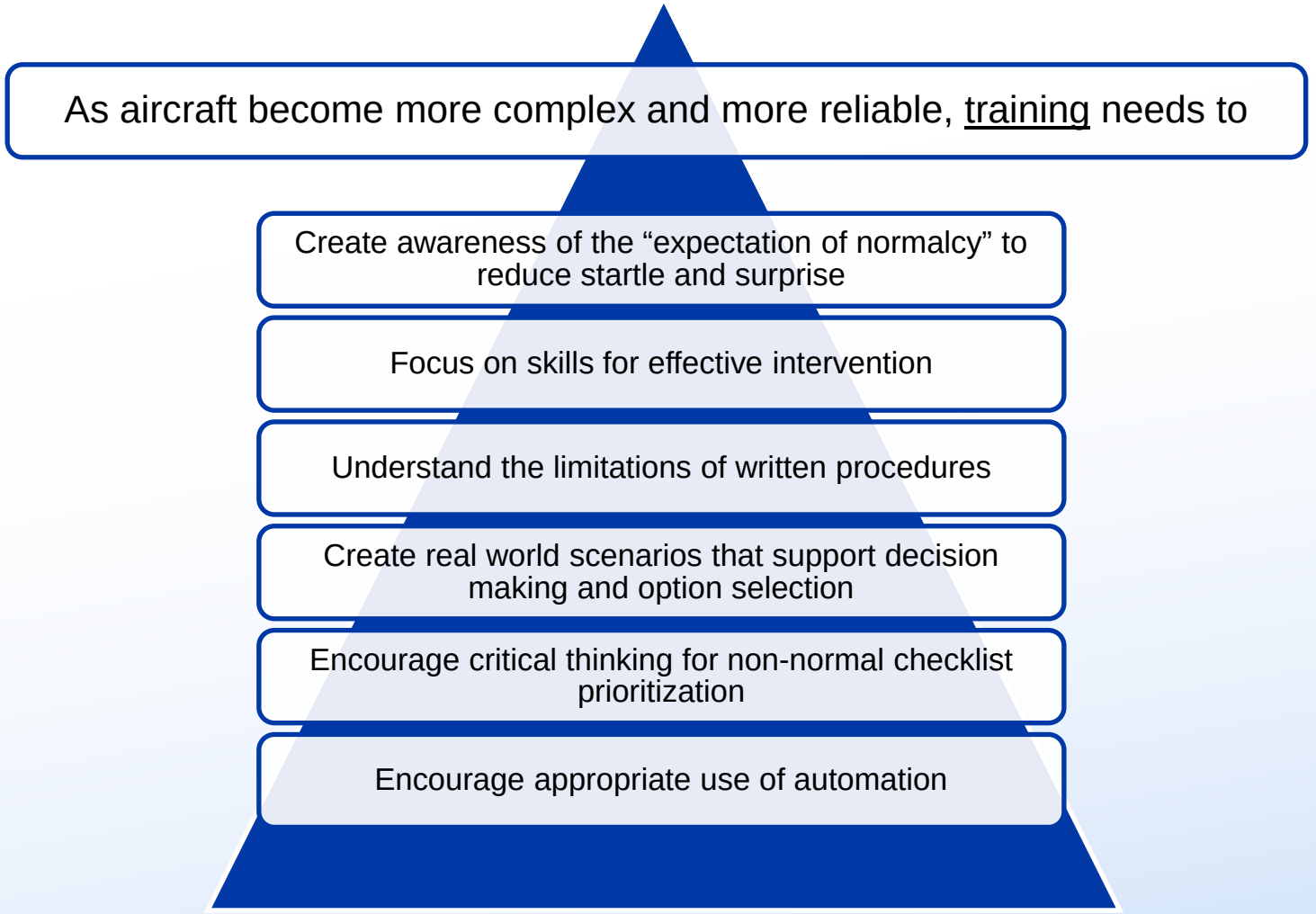


If the airplane is not doing what the crew expects then skill, resilience and behavior is key to regaining a safe immediate flight path in the first instance, sometimes ahead of procedure application.

Boeing Procedures – The Future



Summary


As aircraft become more complex and more reliable, training needs to
Create awareness of the “expectation of normalcy” to reduce startle and surprise
Focus on skills for effective intervention
Understand the limitations of written procedures
Create real world scenarios that support decision making and option selection
Encourage critical thinking for non-normal checklist prioritization
Encourage appropriate use of automation

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