Operational Liaison Meeting 2012

In flight landing performance

New tools to assess your landing performance

Presented by
STLL

AIRBUS

OBJECTIVES

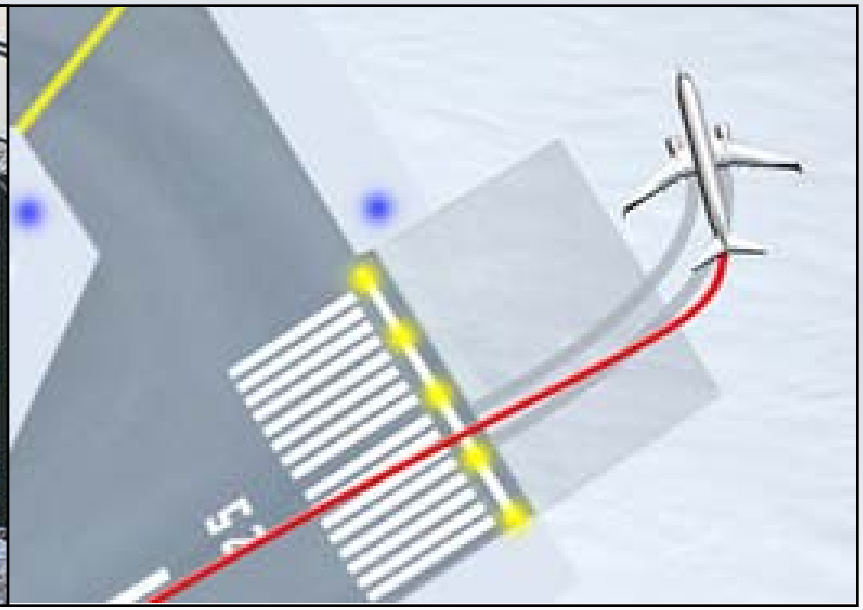
- Know what are the new landing performance assessment tools
- Know how to use them

CONTENTS

CONTENTS

BACKGROUND

- A third of major accidents of large commercial transport aircraft are runway excursions
- Many involve difficulties for the flight crew to realistically assess the landing performance



BACKGROUND

- Currently, **A**ctual **L**anding **D**istance (ALD) is the reference to determine in flight landing performance
- ALD are defined by regulations and based on **flight tests**.

Thus, ALD are not representative of daily operations

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BACKGROUND

- Following runway excursions, the FAA mandated the **TALPA/ARC*** to find a strong industry consensus.
- The purpose was to elaborate common tools to better assess the in-flight landing performance

Dispatchers

Airports

Pilots

All users need to share a common performance reference

* Takeoff and Landing Performance Assessment / Aviation Rulemaking Committee

BACKGROUND

- Following runway excursions, the FAA mandated the **TALPA/ARC*** to find a strong industry consensus.
- The purpose was to elaborate common tools to better assess the in-flight landing performance
- The committee submitted:
  - The **R**unway **C**ondition **A**ssessment **M**atrix (RCAM)
  - Landing distances figures more representative of daily operations
- The references to be used for dispatch are unchanged

* Takeoff and Landing Performance Assessment / Aviation Rulemaking Committee

CONTENTS

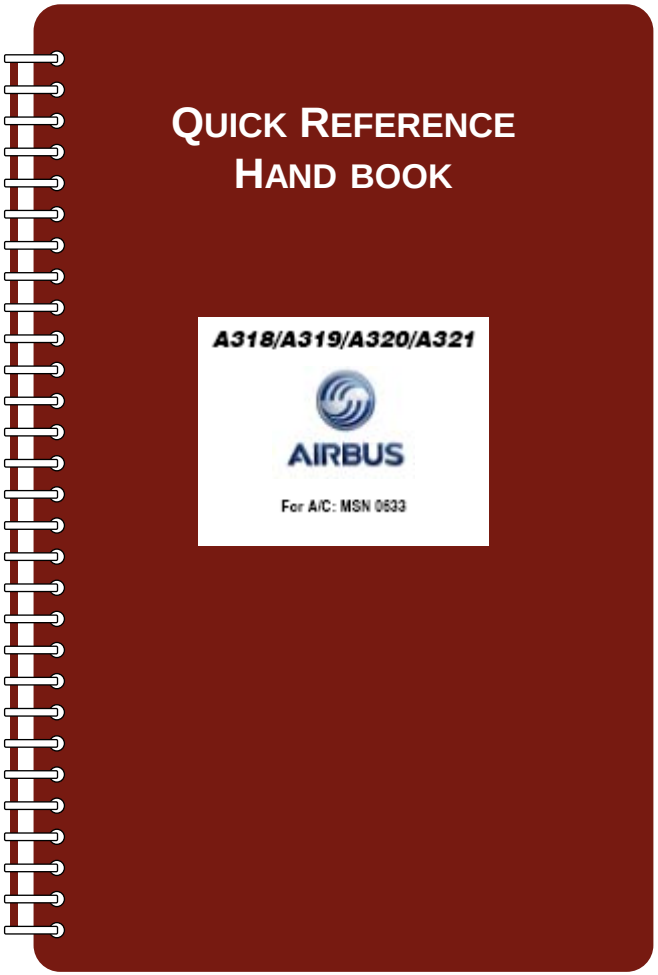
1 BACKGROUND

2 WHAT IS NEW?

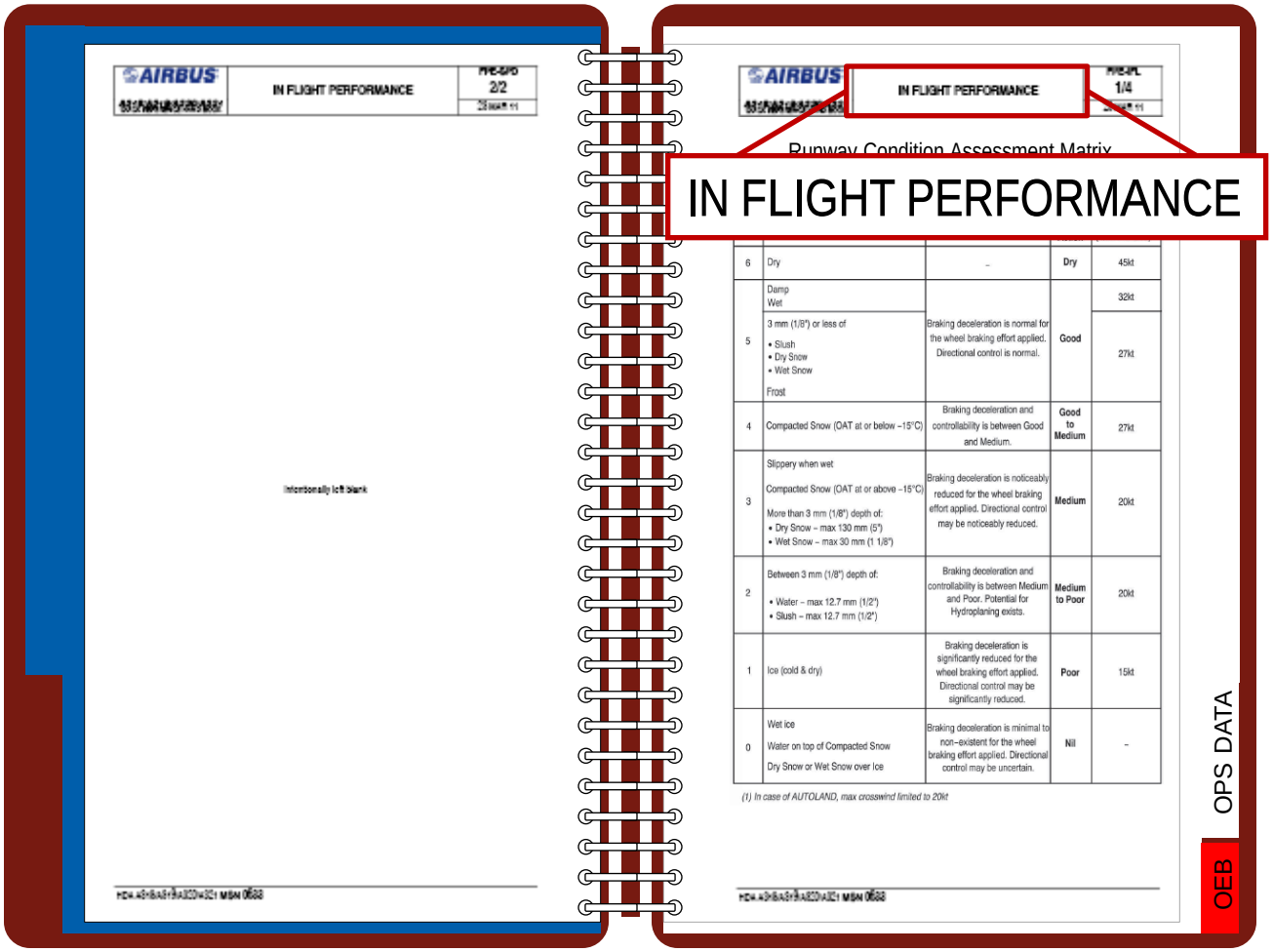
- The **R**unway **C**ondition **A**ssessment **M**atrix (RCAM)
- New landing performance without failure
- New landing performance with failure

CONTENTS

WHAT IS NEW? - Runway Condition Assessment Matrix



WHAT IS NEW? - Runway Condition Assessment Matrix

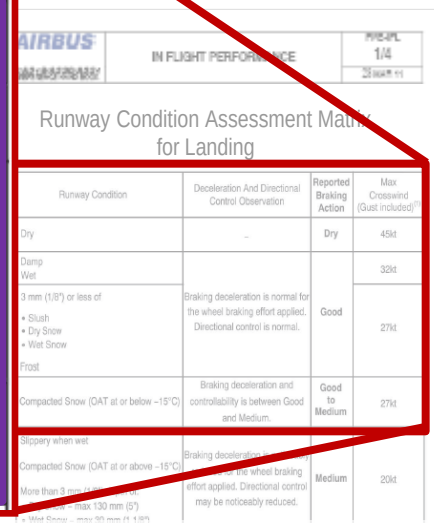


6	Dry	-	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	32kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt
3	Slippery when wet Compacted Snow (OAT at or above –15°C) More than 3 mm (1/8") depth of: • Dry Snow – max 130 mm (5") • Wet Snow – max 30 mm (1 1/8")	Braking deceleration is noticeably reduced for the wheel braking effort applied. Directional control may be noticeably reduced.	Medium	20kt
2	Between 3 mm (1/8") depth of: • Water – max 12.7 mm (1/2") • Slush – max 12.7 mm (1/2")	Braking deceleration and controllability is between Medium and Poor. Potential for Hydroplaning exists.	Medium to Poor	20kt
1	Ice (cold & dry)	Braking deceleration is significantly reduced for the wheel braking effort applied. Directional control may be significantly reduced.	Poor	15kt
0	Wet ice Water on top of Compacted Snow Dry Snow or Wet Snow over Ice	Braking deceleration is minimal to non-existent for the wheel braking effort applied. Directional control may be uncertain.	Nil	-

(1) In case of AUTOLAND, max crosswind limited to 20kt

WHAT IS NEW? - Runway Condition Assessment Matrix

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	45kt 27kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt



The purpose is to provide all users with an unique reference to share:

- The **Runway Condition**,
- The **Reported Braking Action** (and associated Code),
- The recommended **Max**imum **Crosswind**,
- Additional information.

WHAT IS NEW? - Runway Condition Assessment Matrix

- How to use the **R**unway **C**ondition **A**ssessment **M**atrix - 1st example

Runway Condition:
2 mm of Slush

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet			45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

Use all existing information to assess the landing performance

With the **Runway Condition** only:

➡ Use directly the corresponding Braking Action and Maximum Crosswind

WHAT IS NEW? - Runway Condition Assessment Matrix

- How to use the **R**unway **C**ondition **A**ssessment **M**atrix - 2nd example

Runway Condition: Dry

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

Use all existing information to assess the landing performance

With both the **Runway Condition**

WHAT IS NEW? - Runway Condition Assessment Matrix

- How to use the **R**unway **C**ondition **A**ssessment **M**atrix - 2nd example

Runway Condition: Dry

Reported Braking Action: Good

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Dry	45kt
5	Damp Wet		Good	45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

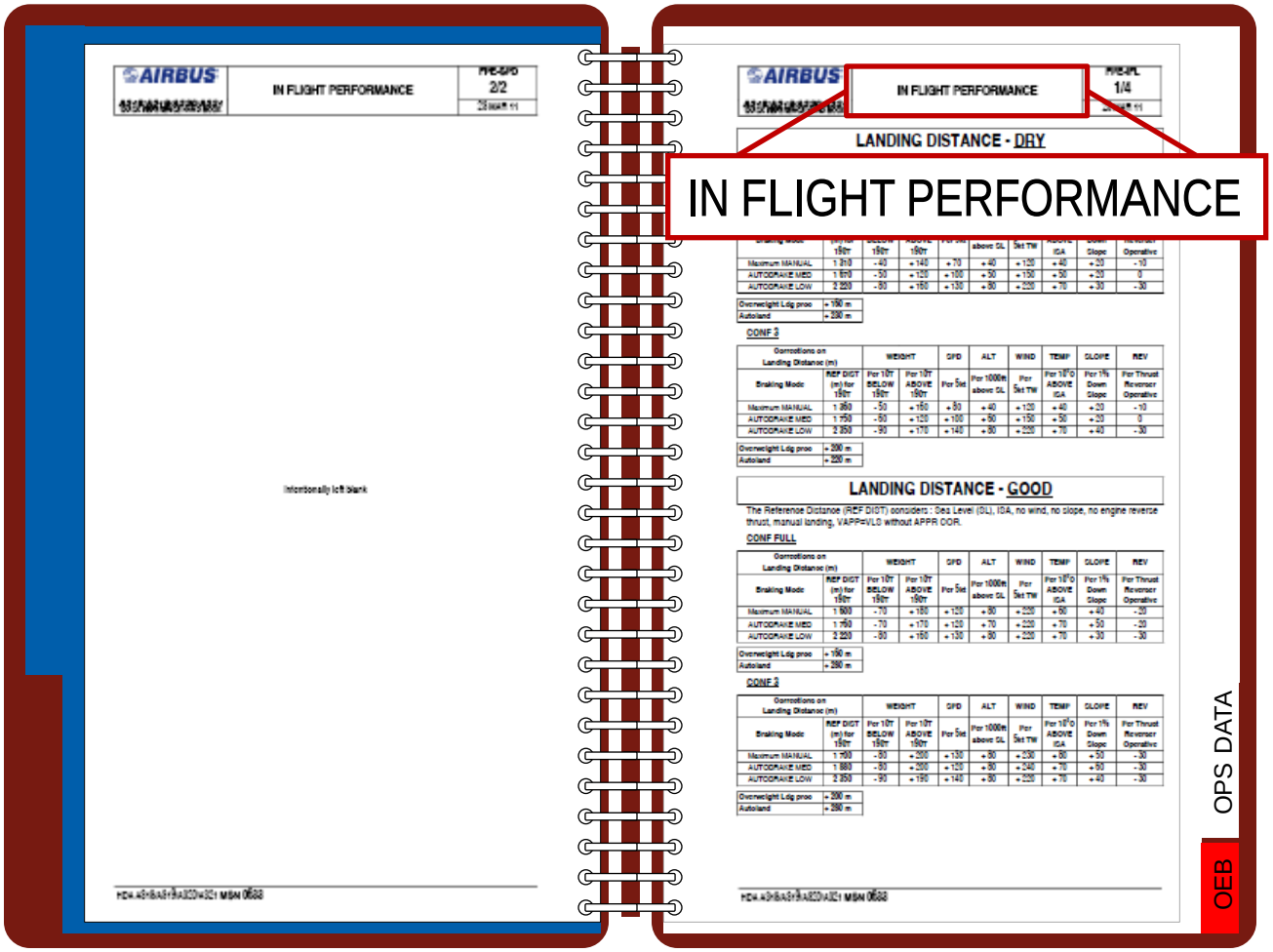
Use all existing information to assess the landing performance

With both the **Runway Condition** and the **Braking Action**:

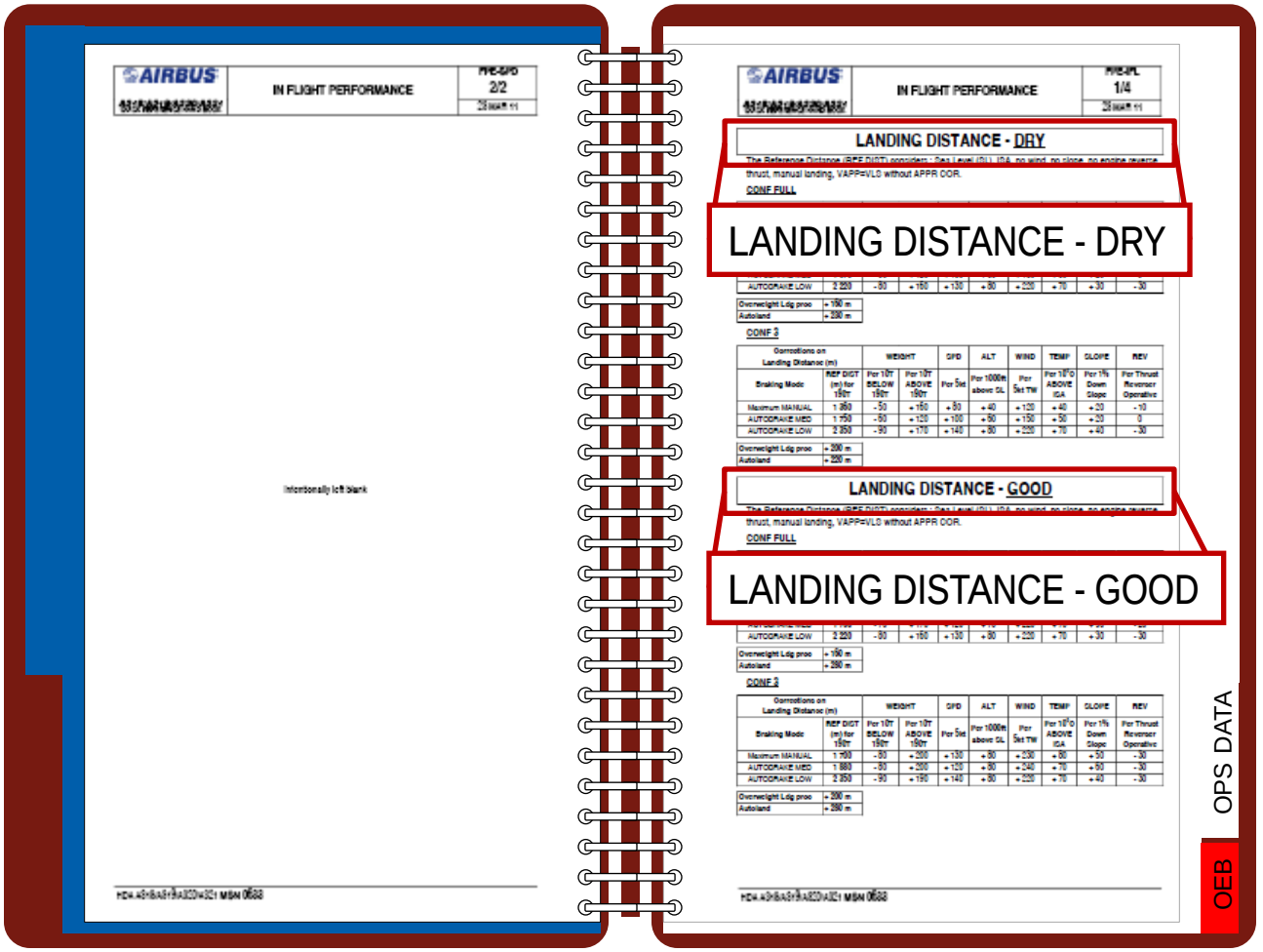
➡ Use the **MOST CONSERVATIVE** Braking Action and associated Maximum Crosswind

CONTENTS

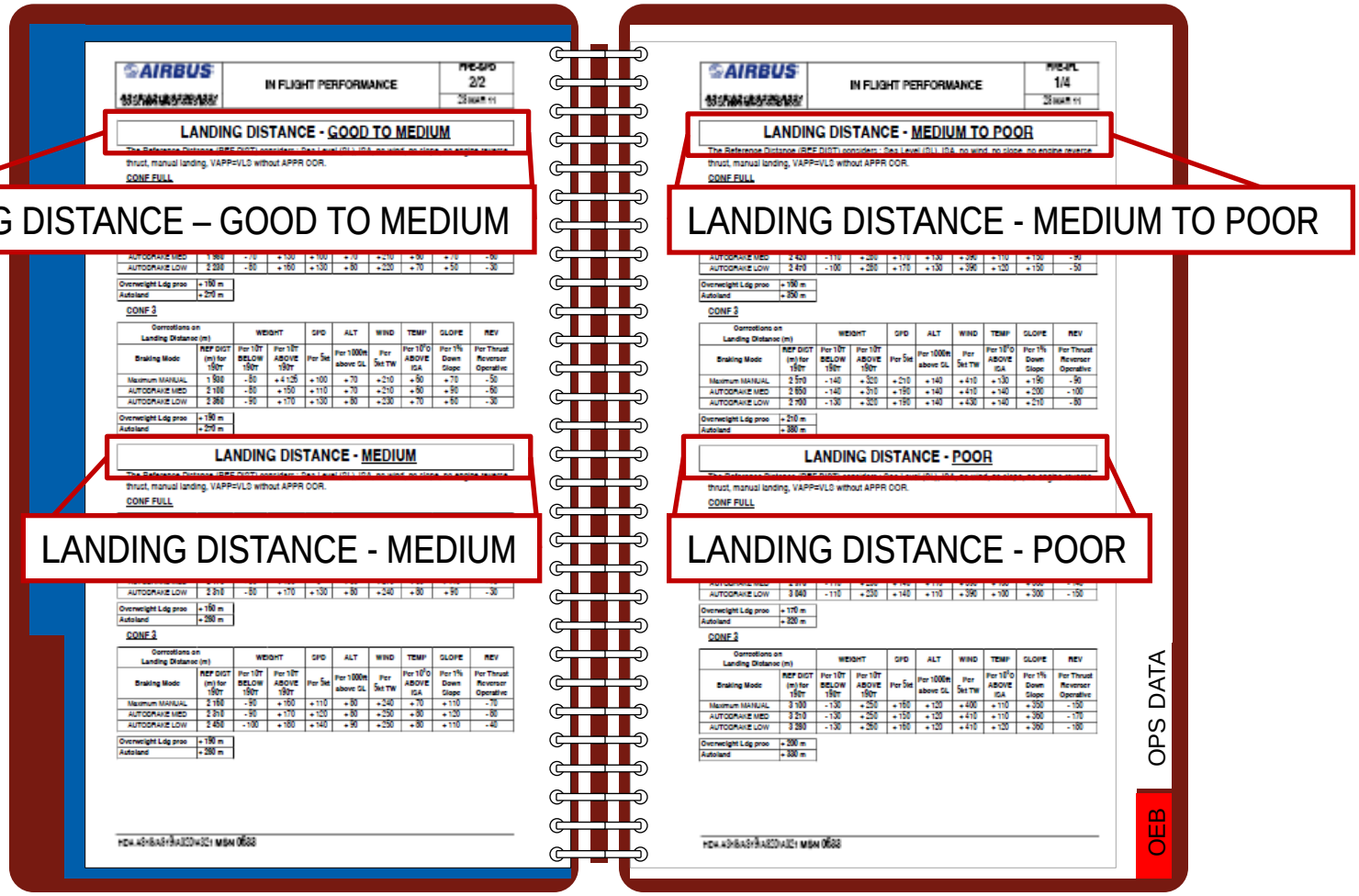
WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE



WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE



WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE



WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE

LANDING DISTANCE - DRY

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP=VLS without APPR COR.

CONF FULL

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 310	- 40	+ 140	+ 70	+ 40	+ 120	+ 40	+ 20	- 10
AUTOBRAKE MED	1 670	- 50	+ 120	+ 100	+ 50	+ 150	+ 50	+ 20	0
AUTOBRAKE LOW	2 220	- 80	+ 160	+ 130	+ 80	+ 220	+ 70	+ 30	- 30

Overweight Ldg proc	+ 160 m
Autoland	+ 230 m

CONF 3

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 360	- 50	+ 160	+ 80	+ 40	+ 120	+ 40	+ 20	- 10
AUTOBRAKE MED	1 750	- 60	+ 120	+ 100	+ 60	+ 150	+ 50	+ 20	0
AUTOBRAKE LOW	2 350	- 90	+ 170	+ 140	+ 80	+ 220	+ 70	+ 40	- 30

Overweight Ldg proc	+ 200 m
Autoland	+ 220 m

Braking Action

Landing Configurations

Braking Modes
(Manual or Auto brake)

The REF DIST
(Provided at fixed landing weight)

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WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE

LANDING DISTANCE - DRY

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP=VLS without APPR COR.

CONF FULL

Corrections on Landing Distance (m)	REF DIST (m) for 190T
Braking Mode	
Maximum MANUAL	1 31
AUTOBRAKE MED	1 67
AUTOBRAKE LOW	2 22
Overweight Ldg proc	+ 160 m
Autoland	+ 230 m

The **REF DIST** considers: Sea Level, ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VLS

CONF 3

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	**REF DIST (m) for 190T**	**Per 10T BELOW 190T**	**Per 10T ABOVE 190T**	**Per 5kt**	**Per 1000ft above SL**	**Per 5kt TW**	**Per 10°C ABOVE ISA**	**Per 1% Down Slope**	**Per Thrust Reverser Operative**
Maximum MANUAL	**1 360**	- 50	+ 160	+ 80	+ 40	+ 120	+ 40	+ 20	- 10
AUTOBRAKE MED	**1 750**	- 60	+ 120	+ 100	+ 60	+ 150	+ 50	+ 20	0
AUTOBRAKE LOW	**2 350**	- 90	+ 170	+ 140	+ 80	+ 220	+ 70	+ 40	- 30
Overweight Ldg proc	**+ 200 m**								
Autoland	**+ 220 m**								

WHAT IS NEW? - LANDING DISTANCE WITHOUT FAILURE

LANDING DISTANCE - DRY

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP=VLS without APPR COR.

CONF FULL

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 310	- 40	+ 140	+ 70	+ 40	+ 120	+ 40	+ 20	- 10
AUTOBRAKE MED	1 670	- 50	+ 120	+ 100	+ 50	+ 150	+ 50	+ 20	0
AUTOBRAKE LOW	2 220	- 80	+ 160	+ 130	+ 80	+ 220	+ 70	+ 30	- 30

Overweight Ldg proc	+ 160 m
Autoland	+ 230 m

CONF 3

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 360	- 50	+ 160	+ 80	+ 40	+ 120	+ 40	+ 20	- 10
AUTOBRAKE MED	1 750	- 60	+ 120	+ 100	+ 60	+ 150	+ 50	+ 20	0
AUTOBRAKE LOW	2 350	- 90	+ 170	+ 140	+ 80	+ 220	+ 70	+ 40	- 30

Overweight Ldg proc	+ 200 m
Autoland	+ 220 m

Braking Action

Landing Configurations

Braking Modes
(Manual or Auto brake)

The REF DIST
(Provided at fixed landing weight)

Corrections
(Weight, SPD, ALT, WIND…)

Additional corrections
(Overweight procedure, Autoland)

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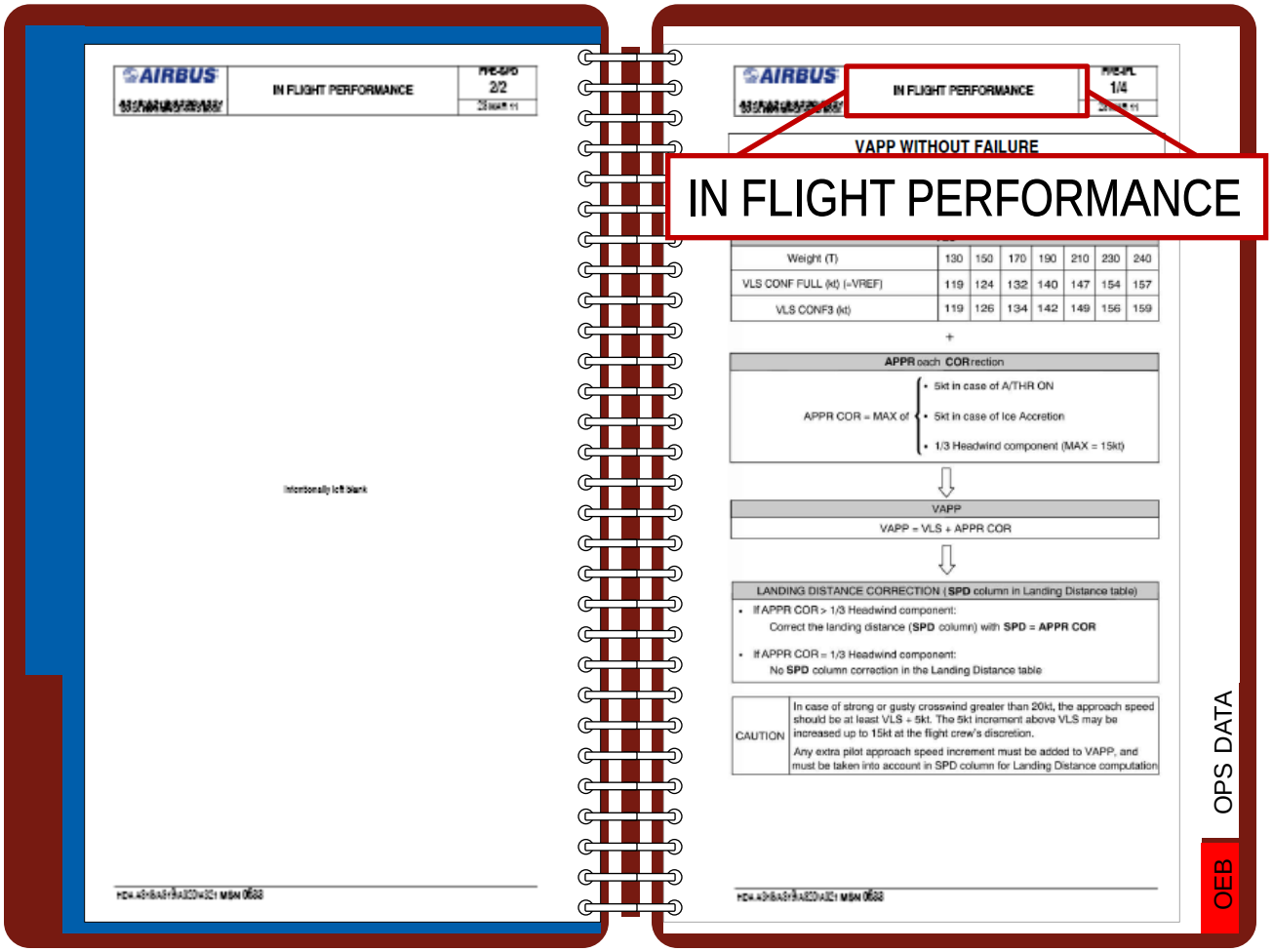
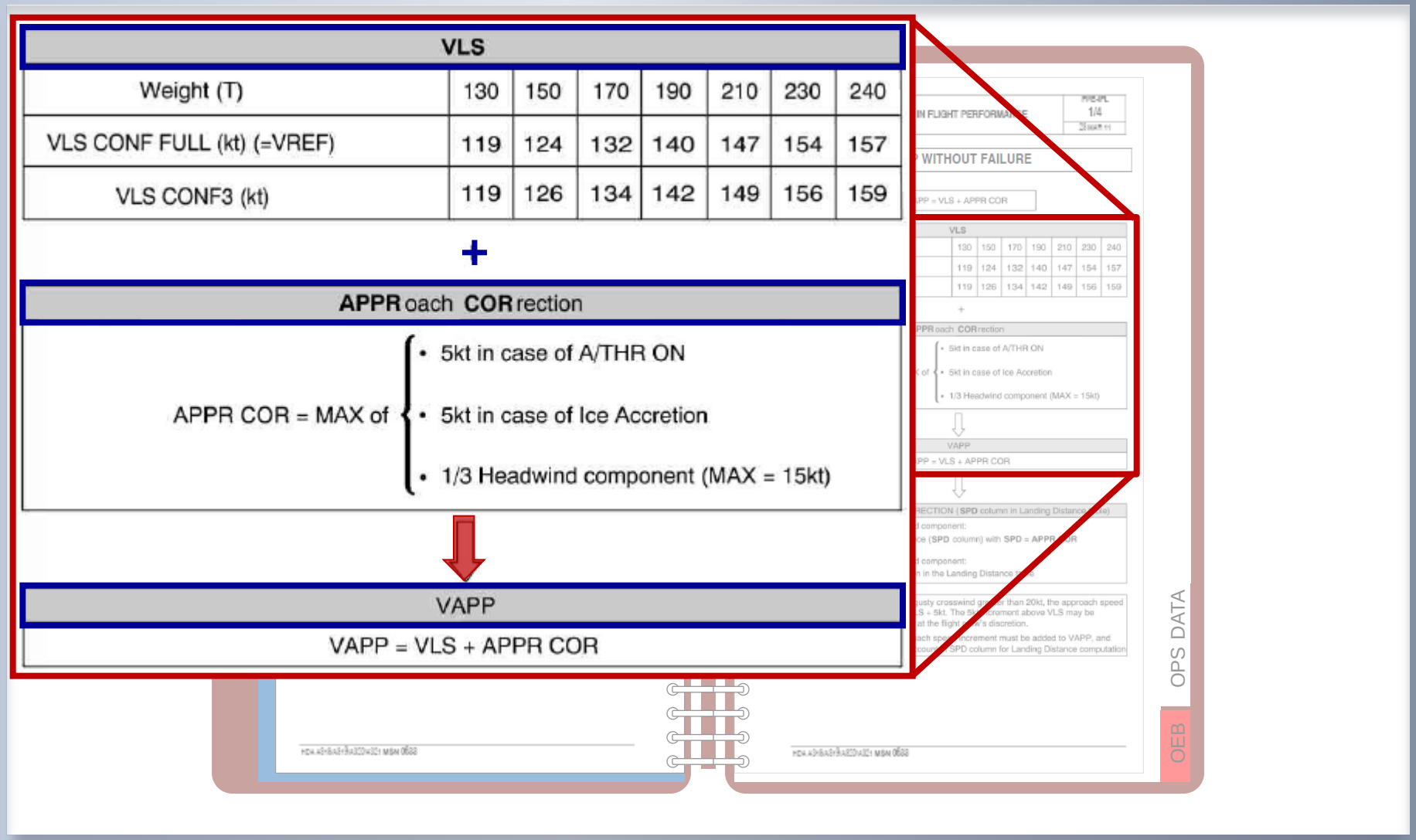
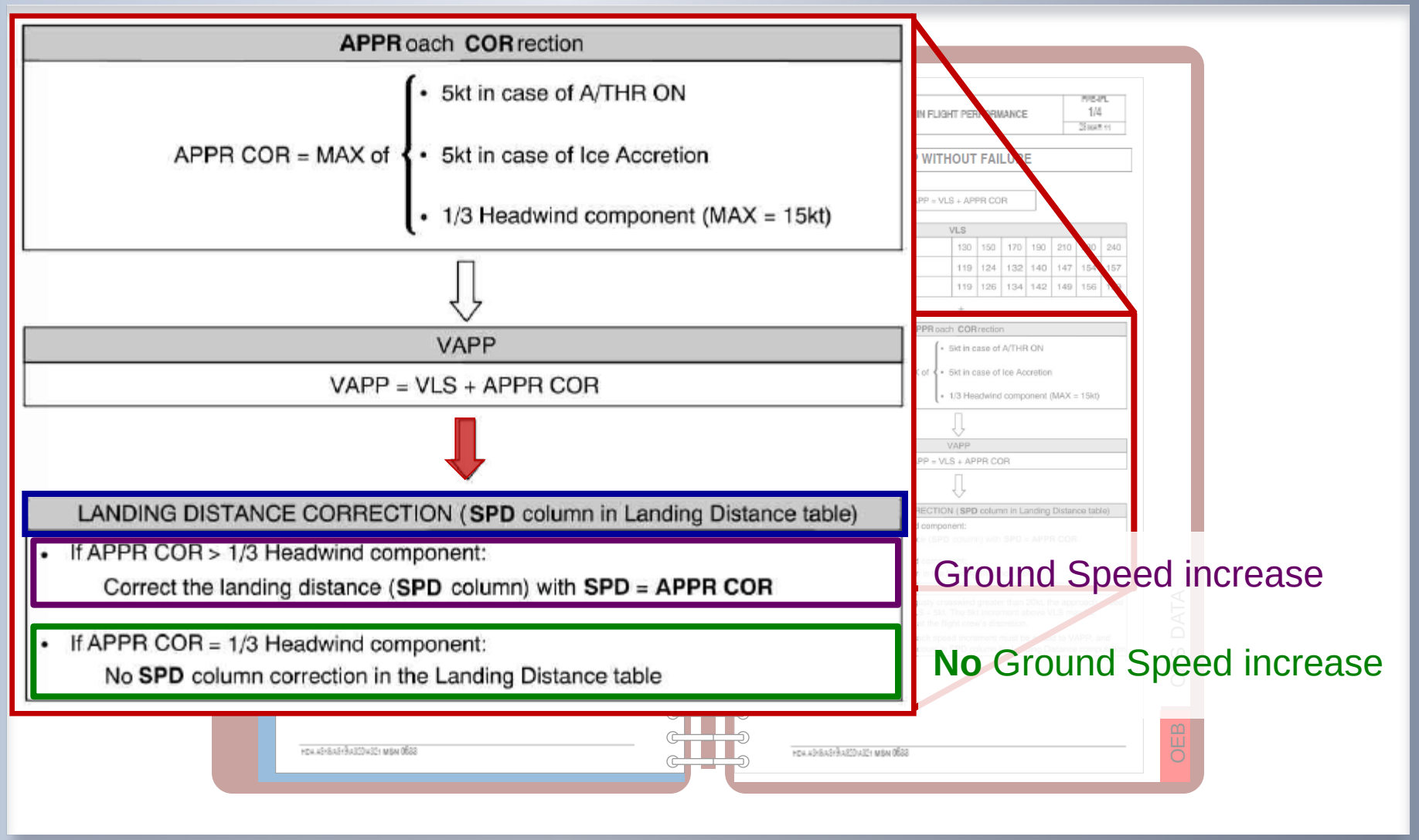
WHAT IS NEW? – VAPP **WITHOUT** FAILURE



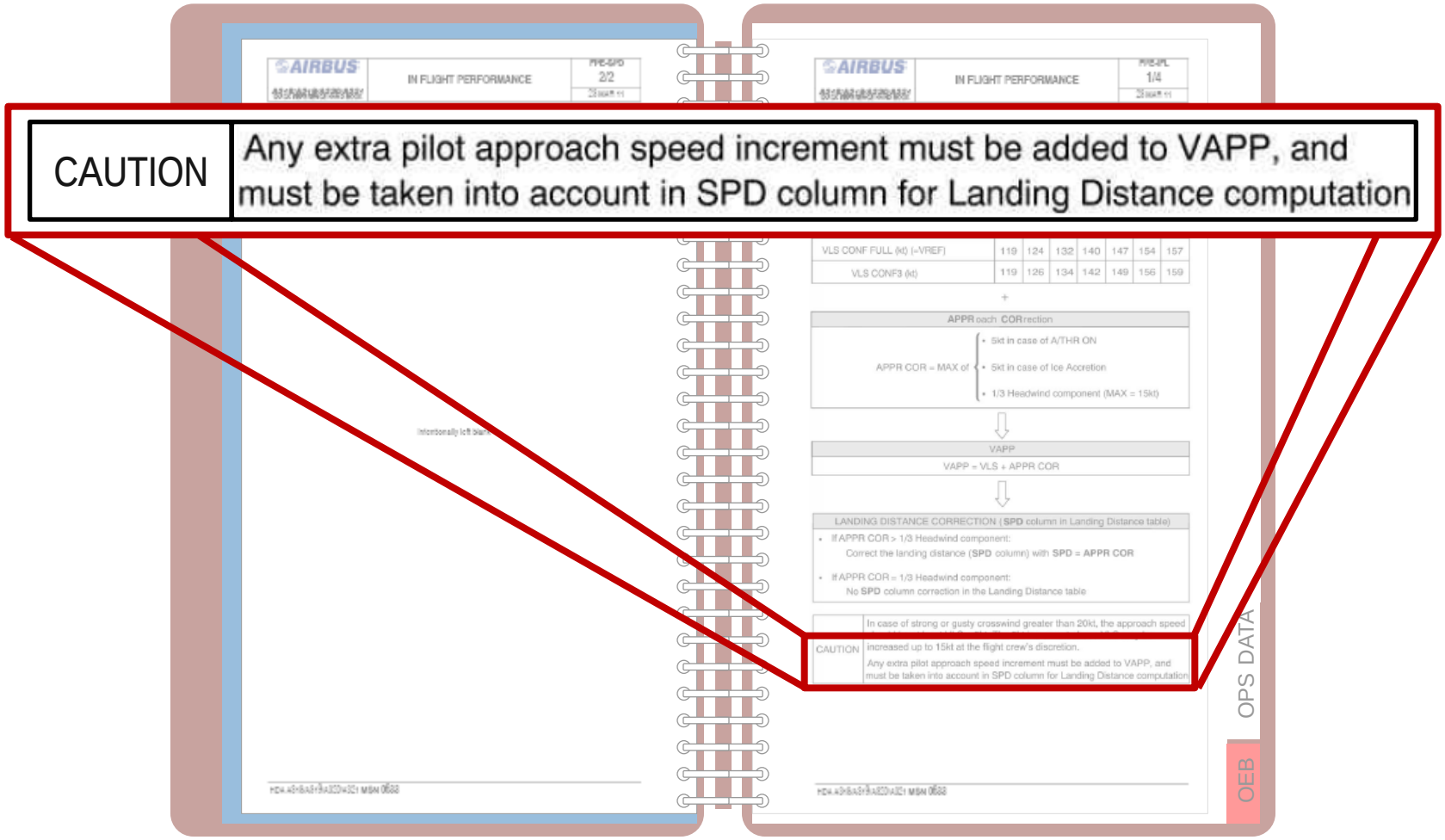
WHAT IS NEW? – VAPP WITHOUT FAILURE



WHAT IS NEW? – VAPP WITHOUT FAILURE



WHAT IS NEW? – VAPP WITHOUT FAILURE



EXAMPLE WITHOUT FAILURE

Landing data

• Aircraft	**A330**
• Runway Condition	**2 mm of Slush**
• Reported Braking Action	**Good to Medium**
• Runway Slope	**1% UP**
• Wind / OAT	**12 kt headwind / - 5°C**
• Airport pressure altitude	**Sea Level**
• Estimated Landing Weight	**170 t**
• Landing configuration	**CONF FULL**
• A/THR	**ON**
• A/BRK	**MED**
• Credit for all thrust reversers	

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EXAMPLE **WITHOUT** FAILURE

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	-	Dry	38kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	38kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			30kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	25kt
3	Slippery when wet Compacted Snow (OAT at or above –15°C) More than 3 mm (1/8") depth of: • Dry Snow – max 130 mm (5") • Wet Snow – max 130 mm (1/8")	Braking deceleration is noticeably reduced for the wheel braking effort applied. Directional control may be noticeably reduced.	Medium	20kt
2	Between 3 mm (1/8") and 12.7 mm (1/2") of: • Water • Slush	Braking deceleration and controllability is between Medium and Poor. Potential for Hydroplaning exists.	Medium to Poor	20kt
1	Ice (cold & dry)	Braking deceleration is significantly reduced for the wheel braking effort applied. Directional control may be significantly reduced.	Poor	15kt
0	Wet ice Water on top of Compacted Snow Dry Snow or Wet Snow over Ice	Braking deceleration is minimal to non-existent for the wheel braking effort applied. Directional control may be uncertain.	Nil	-

(1) In case of AUTOLAND, max crosswind limited to 20kt

Step 1
Identify the
Braking Action

VLS										
Weight (T)	42	46	50	54	58	62	66	70	74	78
VLS CONF FULL (kt) (=VREF)	109	114	119	123	127	132	136	140	144	147
VLS CONF3 (kt)	112	117	122	126	131	135	140	144	148	152

For CG < 25%, add 2kt to VLS CONF FULL and VLS CONF 3

+

APPRoach **COR**rection

APPR COR = MAX of
- 5kt in case of A/THR ON
- 5kt in case of Ice Accretion in CONF FULL
- 10kt in case of Ice Accretion in CONF 3
- 1/3 Headwind component (MAX = 15kt)

⇩

VAPP

VAPP = VLS + APPR COR

⇩

LANDING DISTANCE CORRECTION (**SPD** column in Landing Distance table)
- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the Landing Distance table

CAUTION	In case of strong or gusty crosswind greater than 20kt, VAPP should be least VLS + 5kt. The 5kt increment above VLS may be increased up to 15kt at the flight crew's discretion. Any extra pilot approach speed increment must be added to VAPP, and must be taken into account in SPD column for Landing Distance computation

Step 2
Determine the
VAPP

LANDING DISTANCE - GOOD TO MEDIUM

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP=VLS without APPR COR.

CONF FULL

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 820	- 60	+ 130	+ 100	+ 70	+ 200	+ 60	+ 60	- 40
AUTOBRAKE MED	1 980	- 70	+ 130	+ 100	+ 70	+ 210	+ 60	+ 70	- 60
AUTOBRAKE LOW	2 230	- 80	+ 160	+ 130	+ 80	+ 220	+ 70	+ 50	- 30

Overweight Ldg proc	+ 160 m
Autoland	+ 270 m

CONF 3

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 930	- 80	+ 4 126	+ 100	+ 70	+ 210	+ 60	+ 70	- 50
AUTOBRAKE MED	2 100	- 80	+ 150	+ 110	+ 70	+ 210	+ 60	+ 90	- 60
AUTOBRAKE LOW	2 360	- 90	+ 170	+ 130	+ 80	+ 230	+ 70	+ 60	- 30

Overweight Ldg proc	+ 190 m
Autoland	+ 270 m

Step 3
Calculate the
Landing Distance

EXAMPLE WITHOUT FAILURE

Runway Condition: **2 mm of Slush**

- **Step 1 -** Identify the **Braking Action**

Runway Condition:
2 mm of Slush

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

EXAMPLE WITHOUT FAILURE

Runway Condition: **2 mm of Slush**
Reported Braking Action: **Good to Medium**

- **Step 1 -** Identify the **Braking Action**

Runway Condition: 2 mm of Slush

Reported Braking Action: Good to Medium

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

EXAMPLE WITHOUT FAILURE

Estimated Landing Weight : **170 t**
Landing configuration: **CONF FULL**
A/THR: **ON** - Wind / OAT: **12 kt headwind / - 5°C**

- **Step 2** - Determine the **VAPP**

VLS							
Weight (T)	130	150	170	190	210	230	240
VLS CONF FULL (kt) (=VREF)	119	124	132	140	147	154	157
VLS CONF3 (kt)	119	126	134	142	149	156	159

+

APPRoach **COR**rection

APPR COR = MAX of
- 5kt in case of A/THR ON
- 5kt in case of Ice Accretion
- 1/3 Headwind component (MAX = 15kt)

VAPP

VAPP = VLS + APPR COR

LANDING DISTANCE CORRECTION (**SPD** column in Landing Distance table)

- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the Landing Distance table

VLS (FULL, 170T) = 132kt

5kt

APPR COR (A/THR) = 5kt

4kt

VAPP = 137kt

SPD = APPR COR = 5kt

EXAMPLE WITHOUT FAILURE

From step 1: Good to Medium
From step 2: VAPP = 137kt and SPD = 5kt
CONF FULL, LW = 170T and A/BRK: MED

- **Step 3** - Calculate the **Landing Distance**

LANDING DISTANCE - GOOD TO MEDIUM

CONF FULL

Corrections on Landing Distance (m)		WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
Braking Mode	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
Maximum MANUAL	1 820	- 60	+ 130	+ 100	+ 70	+ 200	+ 60	+ 60	- 40
AUTOBRAKE MED	1 980	- 70	+ 130	+ 100	+ 70	+ 210	+ 60	+ 70	- 60
AUTOBRAKE LOW	2 230	- 80	+ 160	+ 130	+ 80	+ 220	+ 70	+ 50	- 30

REF DIST (190T) = **1980 m**
WEIGHT correction (170T) = - 70 x 2 = **- 140 m**
SPD correction (SPD = 5kt) = **+ 100 m**
ALT correction (Sea Level): NO CORRECTION
WIND correction (12kt headwind): NO CORRECTION
TEMP correction (ΔISA = -20°C): NO CORRECTION
SLOPE correction (1% UP): NO CORRECTION
REV correction = - 60 x 2 = **- 120 m**

Landing Distance = 1820 m

EXAMPLE **WITHOUT** FAILURE - WHAT IF MEL ITEM(S)?

- MEL item(s) that impact(s) the landing performance must also be taken into account in-flight.

AIRBUS FOR TRAINING ONLY **A330/A340** **MASTER MINIMUM EQUIPMENT LIST**	**MMEL OPERATIONAL PROCEDURES** **27 - FLIGHT CONTROLS** 27-64 - Spoiler Hydraulic Actuation
27-64-01A	**Spoiler (one pair inoperative)**

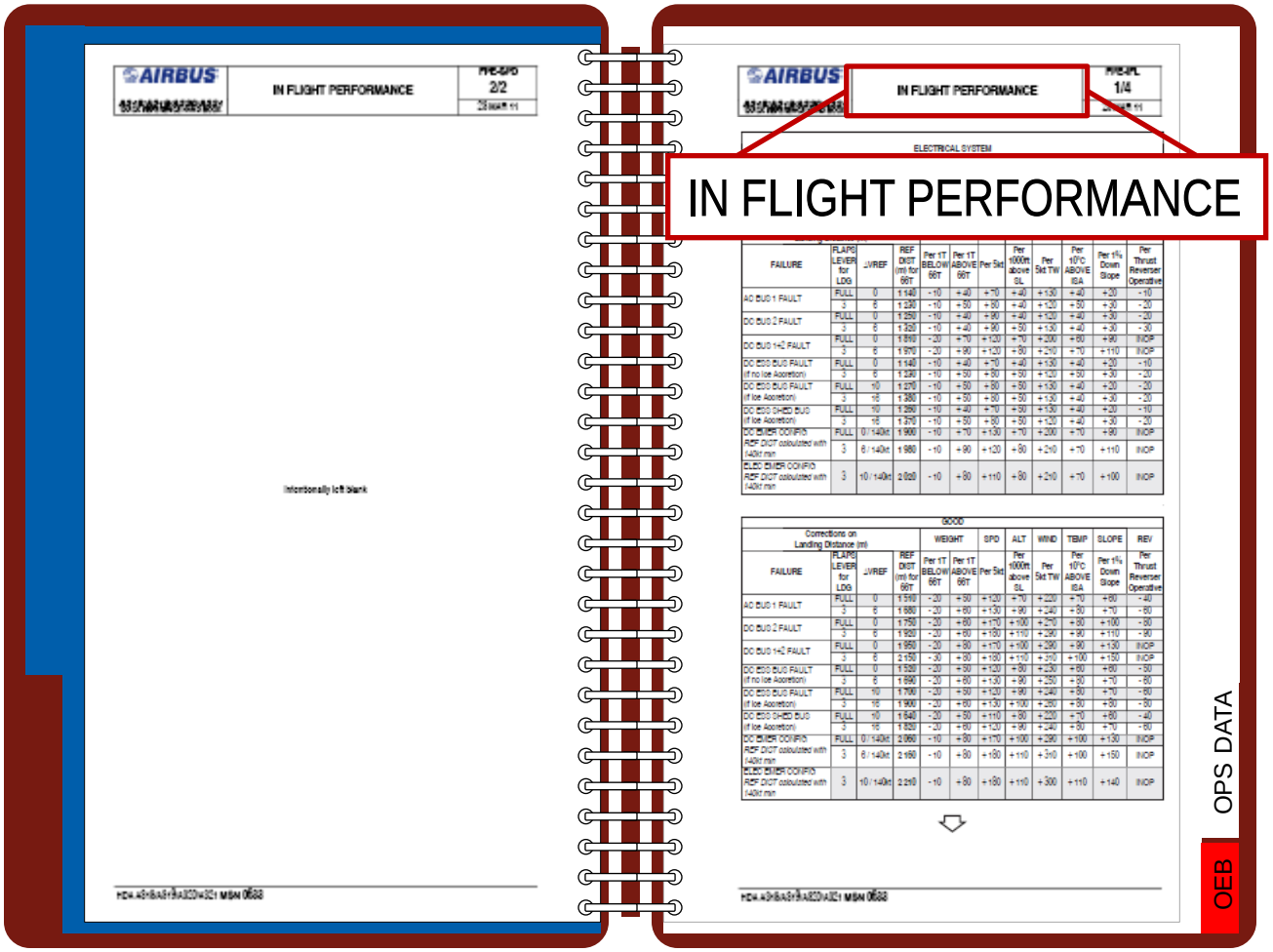
…

Landing performance computation
Multiply the landing distances by 1.02

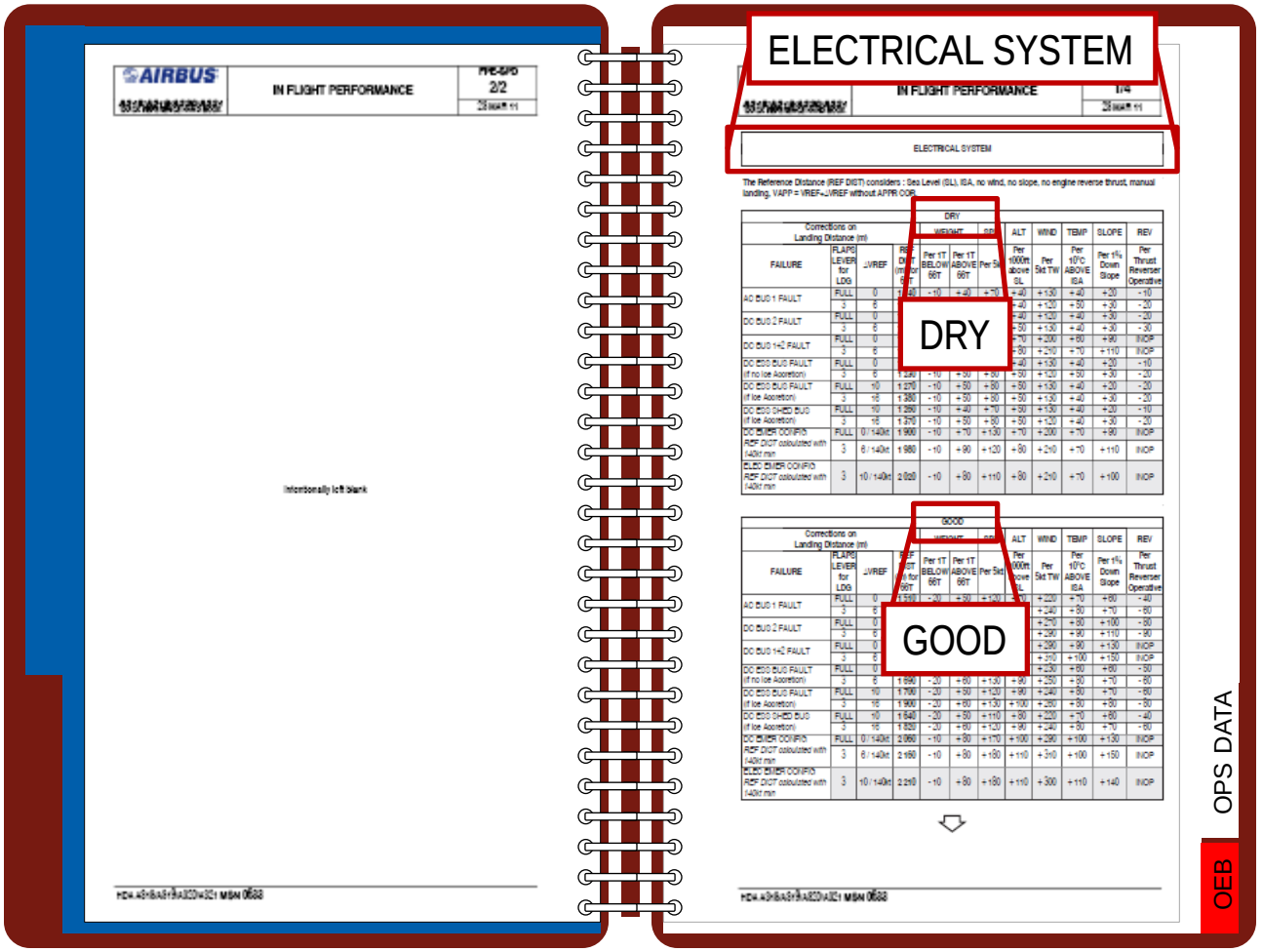
Landing Distance (with MEL 27-64-01A) = Landing Distance (without failure) x 1.02

CONTENTS

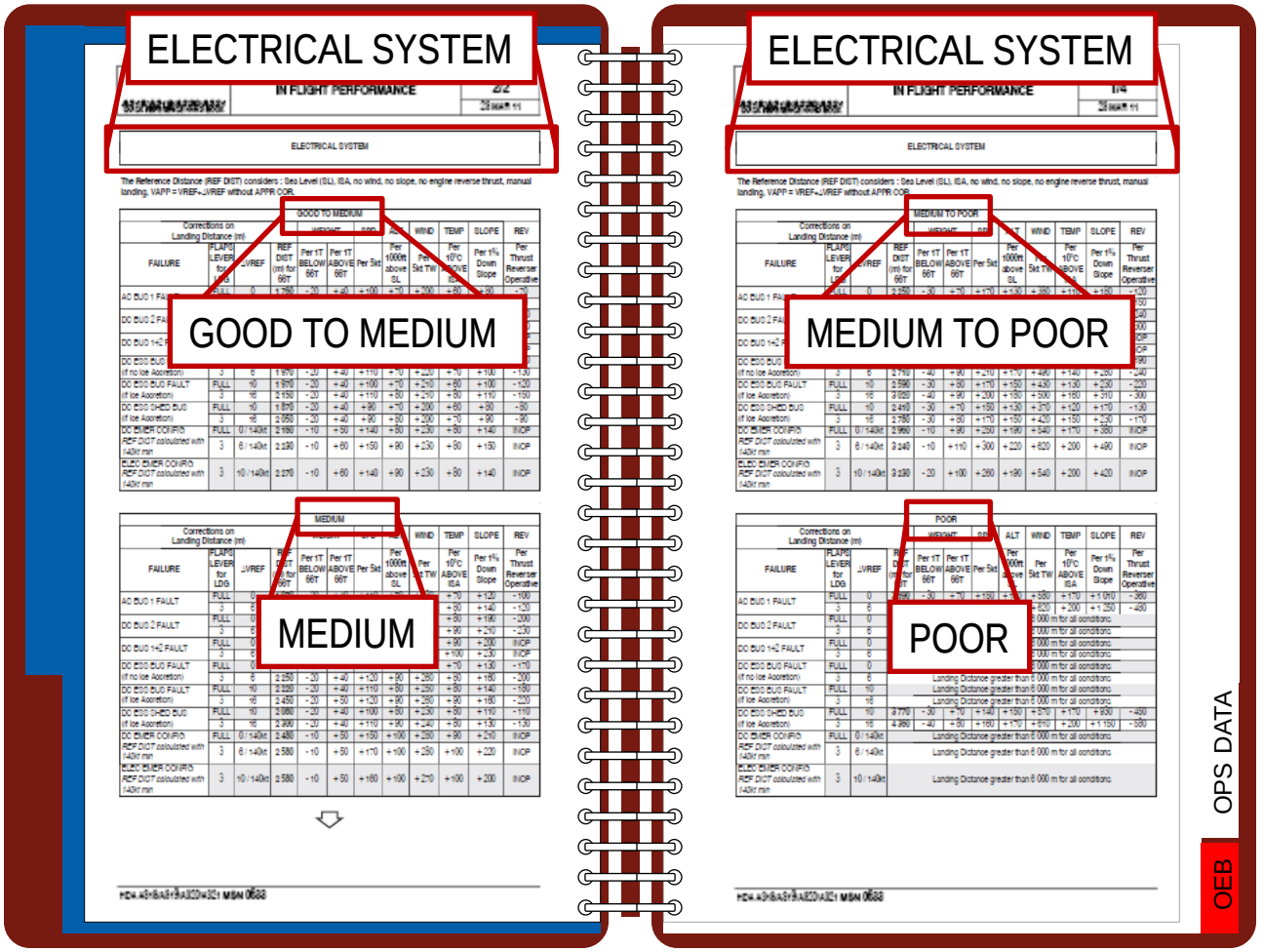
WHAT IS NEW? - LANDING DISTANCE WITH FAILURE



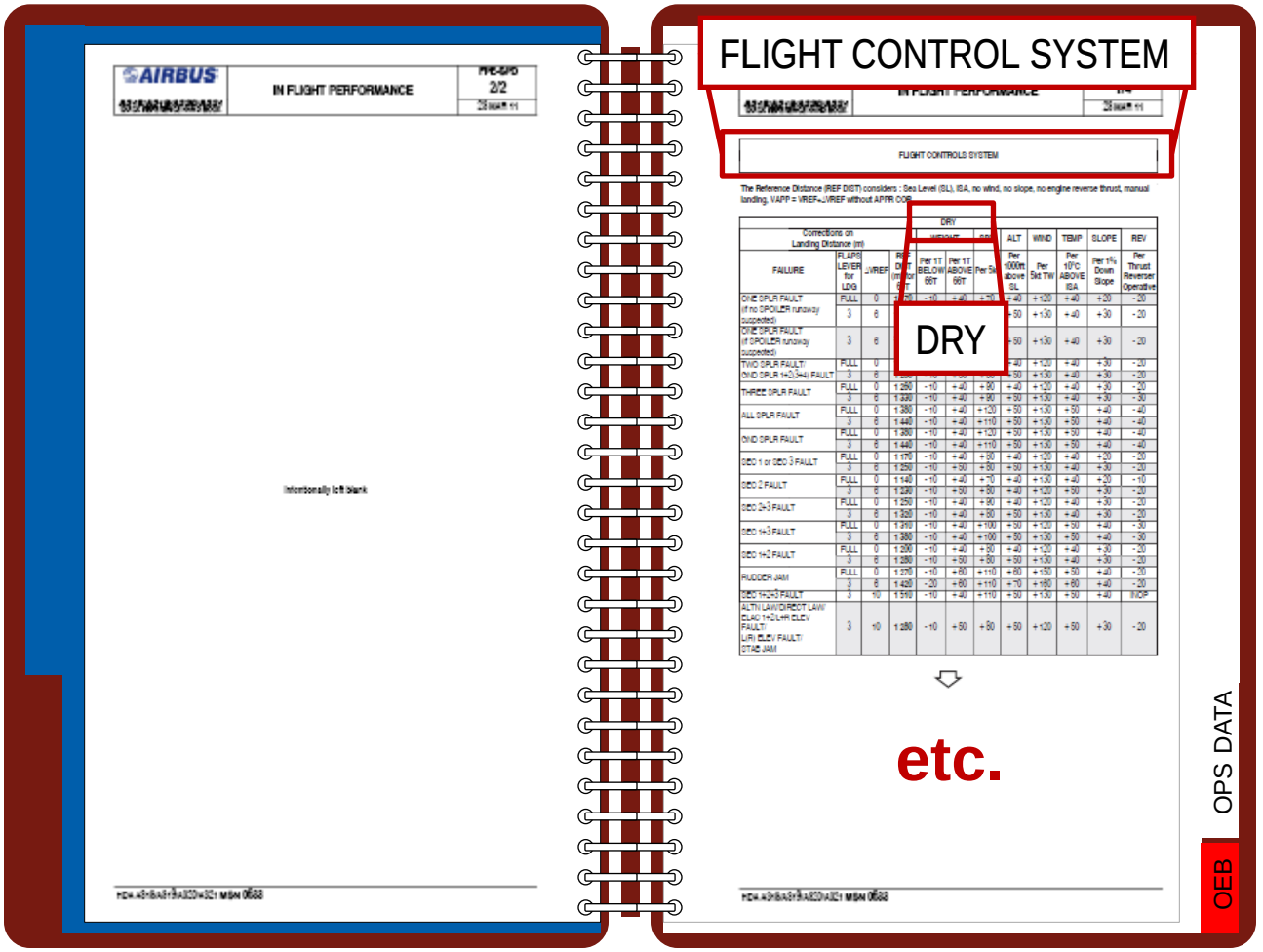
WHAT IS NEW? - LANDING DISTANCE WITH FAILURE



WHAT IS NEW? - LANDING DISTANCE WITH FAILURE



WHAT IS NEW? - LANDING DISTANCE WITH FAILURE



WHAT IS NEW? – LANDING DISTANCE **WITH** FAILURE

ELECTRICAL SYSTEM

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VREF+ΔVREF without APPR COR.

DRY

Corrections on Landing Distance (m)				WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
FAILURE	FLAPS LEVER for LDG	ΔVREF	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
DC BUS 1+2 FAULT	FULL	0	1 410	- 50	+ 130	+ 90	+ 50	+ 130	+ 40	+ 20	INOP
	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	INOP
DC BUS 2 FAULT	FULL	0	1 410	- 50	+ 130	+ 90	+ 50	+ 130	+ 40	+ 20	- 10
	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	- 10
DC ESS BUS FAULT	FULL	10	1 480	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
(if Ice Accretion)	3	15	1 560	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
DC ESS BUS SHED	FULL	10	1 480	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
(if Ice Accretion)	3	15	1 560	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
EMER CONFIG	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	INOP

Aircraft System

Braking Actions

Failure titles

FLAPS lever positions and ΔVREF

The REF DIST
(Provided at fixed landing weight)

WHAT IS NEW? – LANDING DISTANCE WITH FAILURE

ELECTRICAL SYSTEM

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VREF+ΔVREF without APPR COR.

			DRY								
FAILURE	Corrections on Landing Distance: FLAP / EVEN / for LDG										
DC BUS 1+2 FAULT	FULL										
	3										
DC BUS 2 FAULT	FULL										
	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	- 10
DC ESS BUS FAULT (if Ice Accretion)	FULL	10	**1 480**	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
	3	15	**1 560**	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
DC ESS BUS SHED (if Ice Accretion)	FULL	10	**1 480**	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
	3	15	**1 560**	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
EMER CONFIG	3	5	**1 490**	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	INOP

The **REF DIST** considers: Sea Level, ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VREF + ΔVREF

WHAT IS NEW? – LANDING DISTANCE **WITH** FAILURE

ELECTRICAL SYSTEM

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VREF+ΔVREF without APPR COR.

DRY

Corrections on Landing Distance (m)				WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
FAILURE	FLAPS LEVER for LDG	ΔVREF	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
DC BUS 1+2 FAULT	FULL	0	1 410	- 50	+ 130	+ 90	+ 50	+ 130	+ 40	+ 20	INOP
	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	INOP
DC BUS 2 FAULT	FULL	0	1 410	- 50	+ 130	+ 90	+ 50	+ 130	+ 40	+ 20	- 10
	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	- 10
DC ESS BUS FAULT (if Ice Accretion)	FULL	10	1 480	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
	3	15	1 560	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
DC ESS BUS SHED (if Ice Accretion)	FULL	10	1 480	- 40	+ 150	+ 80	+ 50	+ 130	+ 40	+ 20	- 10
	3	15	1 560	- 50	+ 160	+ 80	+ 50	+ 130	+ 40	+ 20	- 20
EMER CONFIG	3	5	1 490	- 50	+ 150	+ 90	+ 50	+ 130	+ 40	+ 20	INOP

Aircraft System

Braking Actions

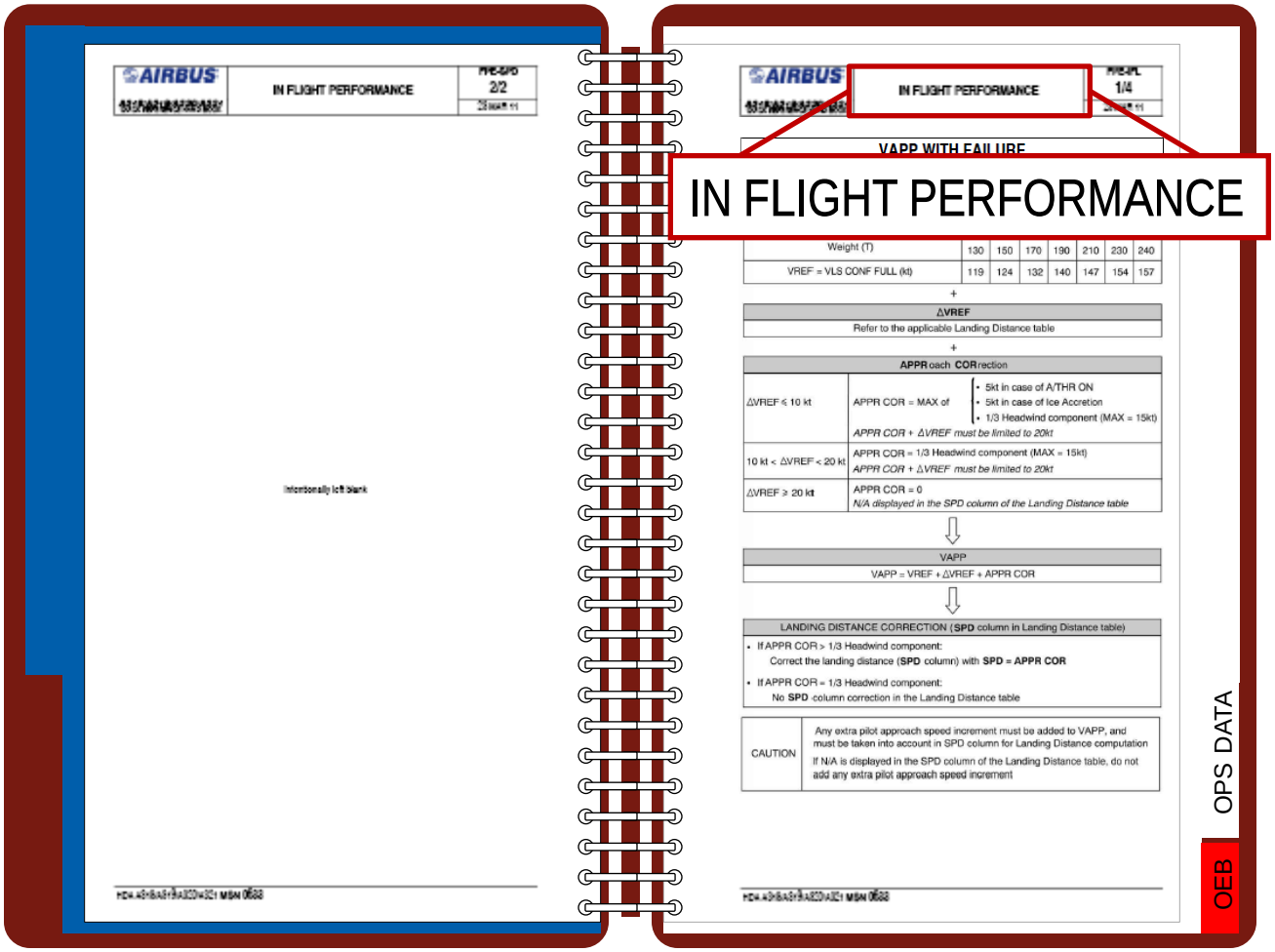
Failure titles

FLAPS lever positions and ΔVREF

The REF DIST
(Provided at fixed landing weight)

Corrections
(Weight, SPD, ALT, WIND…)

WHAT IS NEW? – VAPP WITH FAILURE



WHAT IS NEW? – VAPP WITH FAILURE

VREF

Weight (T)	130	150	170	190	210	230	240
VREF = VLS CONF FULL (kt)	119	124	132	140	147	154	157

+

ΔVREF

Refer to the applicable Landing Distance table

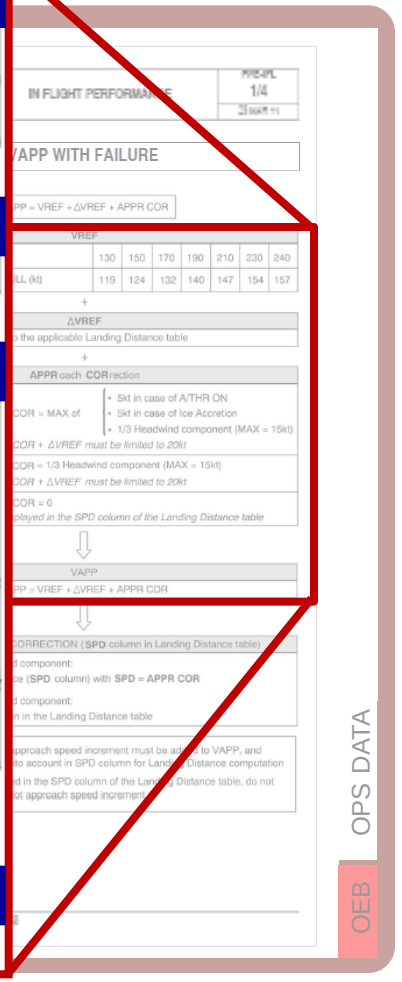
+

APPRoach **COR**rection

ΔVREF ⩽ 10 kt	APPR COR = MAX of • 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
10 kt < ΔVREF < 20 kt	APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
ΔVREF ⩾ 20 kt	APPR COR = 0 *N/A displayed in the SPD column of the Landing Distance table*

VAPP

VAPP = VREF + ΔVREF + APPR COR



WHAT IS NEW? – VAPP WITH FAILURE

APPRoach CORrection	
ΔVREF ⩽ 10 kt	APPR COR = MAX of • 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
10 kt < ΔVREF < 20 kt	APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
ΔVREF ⩾ 20 kt	APPR COR = 0 *N/A displayed in the SPD column of the Landing Distance table*

⇩

VAPP
VAPP = VREF + ΔVREF + APPR COR

⇩

LANDING DISTANCE CORRECTION (SPD column in Landing Distance table)

- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the Landing Distance table

Ground Speed increase

No Ground Speed increase

WHAT IS NEW? – VAPP WITH FAILURE

APPRoach CORrection	
ΔVREF ⩽ 10 kt	APPR COR = MAX of • 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
10 kt < ΔVREF < 20 kt	APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
ΔVREF ⩾ 20 kt	APPR COR = 0 *N/A displayed in the SPD column of the Landing Distance table*

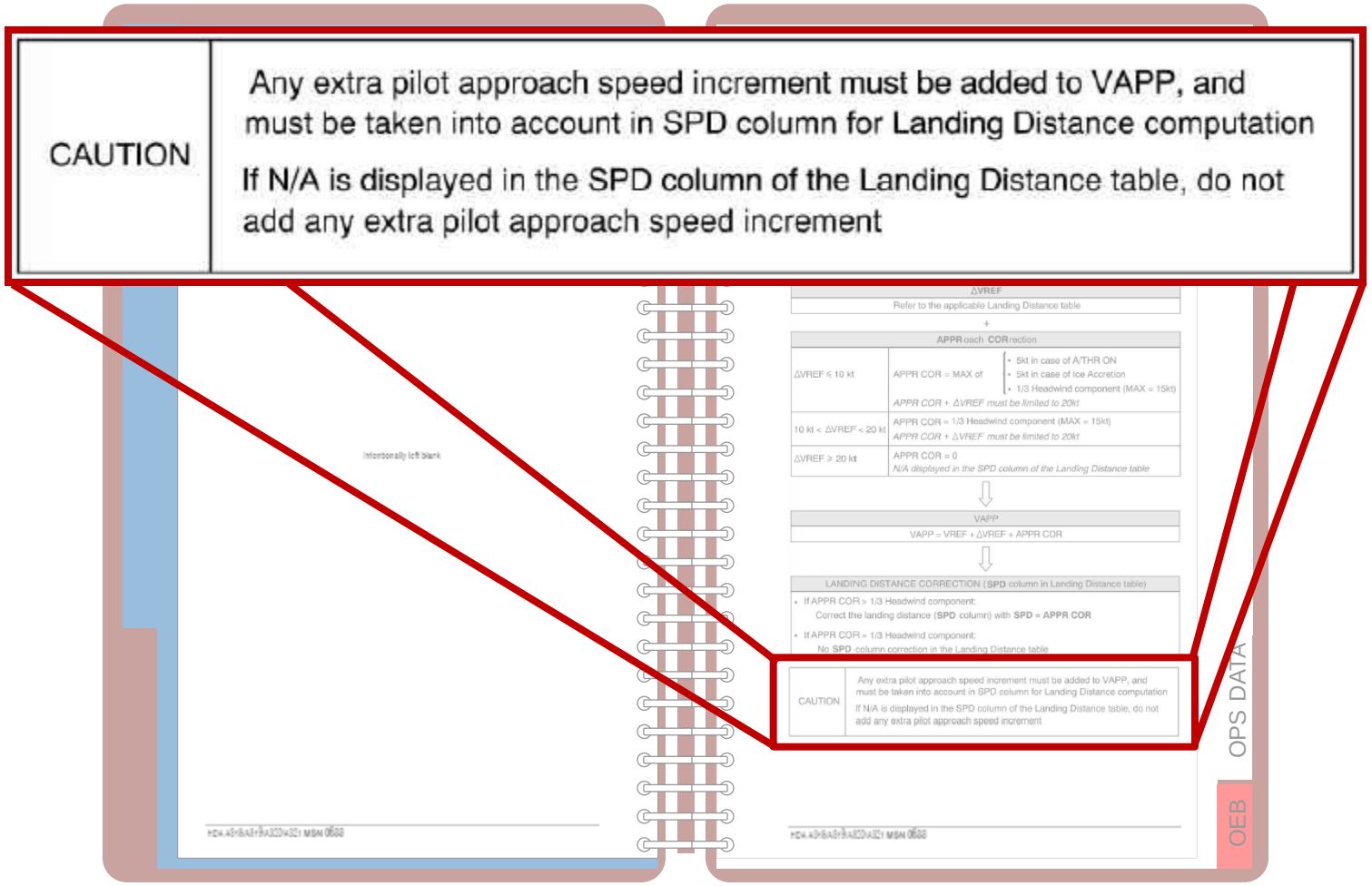
⇩

VAPP
VAPP = VREF + ΔVREF + APPR COR

⇩

LANDING DISTANCE CORRECTION (**SPD** column in Landing Distance table)
• If APPR COR > 1/3 Headwind component: Correct the landing distance (**SPD** column) with **SPD = APPR COR** • If APPR COR = 1/3 Headwind component: No **SPD** column correction in the Landing Distance table

WHAT IS NEW? – VAPP WITH FAILURE



EXAMPLE WITH FAILURE

Landing data

- Aircraft **A330**
- Runway Condition **Compacted snow**
- Reported Braking Action **Good**
- Wind / OAT **12 kt headwind / - 15°C**
- Airport pressure altitude **1000ft**
- Estimated Landing Weight **190 t**
- A/THR **ON**
- In-Flight failure **ENG 1 SHUTDOWN** (no damage)
- Credit for all available thrust reversers

EXAMPLE WITH FAILURE

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	38kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	Good	38kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			30kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	25kt
3	Slippery when wet Compacted Snow (OAT at or above –15°C) More than 3 mm (1/8") depth of: • Dry Snow – max 130 mm (5") • Wet Snow – max 130 mm (1/8")	Braking deceleration is noticeably reduced for the wheel braking effort applied. Directional control may be noticeably reduced.	Medium	20kt
2	Between 3 mm (1/8") and 12.7 mm (1/2") of: • Water • Slush	Braking deceleration and controllability is between Medium and Poor. Potential for Hydroplaning exists.	Medium to Poor	20kt
1	Ice (cold & dry)	Braking deceleration is significantly reduced for the wheel braking effort applied. Directional control may be significantly reduced.	Poor	15kt
0	Wet ice Water on top of Compacted Snow Dry Snow or Wet Snow over Ice	Braking deceleration is minimal to non-existent for the wheel braking effort applied. Directional control may be uncertain.	Nil	–

(1) In case of AUTOLAND, max crosswind limited to 20kt

Step 1
Identify the
Braking Action

VAPP = VREF + ΔVREF + APPR COR

VREF							
Weight (T)	48	52	56	60	64	68	72
VREF = VLS CONF FULL (kt)	118	123	127	132	136	140	144

+

ΔVREF

Refer to the applicable OLD table

+

APPR oach COR rection		
ΔVREF ≤ 10 kt	APPR COR = MAX of	• 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt)
10 kt < ΔVREF < 20 kt	APPR COR + ΔVREF *must be limited to 20kt* APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*	
ΔVREF ≥ 20 kt	APPR COR = 0	

⇩

VAPP

VAPP = VREF + ΔVREF + APPR COR

⇩

OPERATIONAL LANDING DISTANCE CORRECTION (**SPD** column in OLD table)

- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the OLD table

CAUTION	Any extra pilot approach speed increment must be added to VAPP, and must be taken into account in SPD column for OLD computation

Step 2
Determine the
VAPP

ENGINE SYSTEM

The Reference Distance (REF DIST) considers : Sea Level (SL), ISA, no wind, no slope, no engine reverse thrust, manual landing, VAPP = VREF+ΔVREF without APPR COR.

GOOD TO MEDIUM											
Corrections on Landing Distance (m)				WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
FAILURE	FLAPS LEVER for LDG	ΔVREF	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
SHUTDOWN (If no damage)	3	5	2 080	- 80	+ 150	+ 120	+ 80	+ 210	+ 70	+ 90	- 70
SHUTDOWN (If damage without Ice Accretion)	3	5	2 080	- 80	+ 150	+ 120	+ 80	+ 210	+ 70	+ 90	- 70
SHUTDOWN (If damage with Ice Accretion)	3	10	2 180	- 80	+ 150	+ 130	+ 80	+ 220	+ 80	+ 90	- 80
THR LEVER FAULT/ DIGAGREE	3	5	2 040	- 70	+ 140	+ 110	+ 80	+ 220	+ 60	+ 80	- 40
REV UNLOCKED (with buffet)	2	25	2 420	- 80	+ 150	N/A	+ 90	+ 210	+ 80	+ 90	- 90

Step 3
Calculate the
Landing Distance

EXAMPLE WITH FAILURE

Runway Condition: **Compacted Snow**

- **Step 1** - Identify the **Braking Action**

Runway Condition: Compacted Snow

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	**Dry**	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.	**Good**	45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost			27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	**Good to Medium**	27kt

EXAMPLE WITH FAILURE

Runway Condition: **Compacted Snow**
Reported Braking Action: **Good**

- **Step 1** - Identify the **Braking Action**

Runway Condition: Compacted Snow

Reported Braking Action: Good

Code	Runway Condition	Deceleration And Directional Control Observation	Reported Braking Action	Max Crosswind (Gust included)(1)
6	Dry	–	Dry	45kt
5	Damp Wet	Braking deceleration is normal for the wheel braking effort applied. Directional control is normal.		45kt
	3 mm (1/8") or less of • Slush • Dry Snow • Wet Snow Frost		Good	27kt
4	Compacted Snow (OAT at or below –15°C)	Braking deceleration and controllability is between Good and Medium.	Good to Medium	27kt

EXAMPLE WITH FAILURE

Estimated Landing Weight : **190 t**
A/THR: **ON**
Wind / OAT: **12 kt headwind / - 15°C**

- **Step 2** - Determine the **VAPP**

VREF							
Weight (T)	130	150	170	190	210	230	240
VREF = VLS CONF FULL (kt)	119	124	132	140	147	154	157

+

ΔVREF

Refer to the applicable Landing Distance table

+

APPRoach **COR**rection

ΔVREF ⩽ 10 kt	APPR COR = MAX of • 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
10 kt < ΔVREF < 20 kt	APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*
ΔVREF ⩾ 20 kt	APPR COR = 0 *N/A displayed in the SPD column of the Landing Distance table*

⇩

VAPP

VAPP = VREF + ΔVREF + APPR COR

⇩

LANDING DISTANCE CORRECTION (SPD column in Landing Distance table)

- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the Landing Distance table

VREF (190T) = 140kt

ΔVREF = 5kt

Corrections on Landing Distance (m)			
FAILURE	FLAPS LEVER for LDG	ΔVREF	REF DIST (m) for 190T
SHUTDOWN (if no damage)	3	5	2 080

EXAMPLE WITH FAILURE

Estimated Landing Weight : **190 t**
A/THR: **ON**
Wind / OAT: **12 kt headwind / - 15°C**

- **Step 2** - Determine the **VAPP**

VREF

Weight (T)	130	150	170	190	210	230	240
VREF = VLS CONF FULL (kt)	119	124	132	140	147	154	157

+

ΔVREF

Refer to the applicable Landing Distance table

+

APPRoach **COR**rection

ΔVREF ⩽ 10 kt	APPR COR = MAX of • 5kt in case of A/THR ON • 5kt in case of Ice Accretion • 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*	5kt 4kt
10 kt < ΔVREF < 20 kt	APPR COR = 1/3 Headwind component (MAX = 15kt) *APPR COR + ΔVREF must be limited to 20kt*	
ΔVREF ⩾ 20 kt	APPR COR = 0 *N/A displayed in the SPD column of the Landing Distance table*	

⇩

VAPP

VAPP = VREF + ΔVREF + APPR COR

⇩

LANDING DISTANCE CORRECTION (SPD column in Landing Distance table)

- If APPR COR > 1/3 Headwind component:
  Correct the landing distance (**SPD** column) with **SPD = APPR COR**
- If APPR COR = 1/3 Headwind component:
  No **SPD** column correction in the Landing Distance table

VREF (190T) = 140kt

ΔVREF = 5kt

APPR COR (A/THR) = 5kt

VAPP = 150kt

SPD = APPR COR = 5kt

AIRBUS

EXAMPLE WITH FAILURE

From step 1: Good to Medium
From step 2: VAPP = 150kt and SPD = 5kt
Estimated Landing Weight : **190 t**

- **Step 3** - Calculate the **Landing Distance**

ENGINE SYSTEM

GOOD TO MEDIUM

Corrections on Landing Distance (m)				WEIGHT		SPD	ALT	WIND	TEMP	SLOPE	REV
FAILURE	FLAPS LEVER for LDG	ΔVREF	REF DIST (m) for 190T	Per 10T BELOW 190T	Per 10T ABOVE 190T	Per 5kt	Per 1000ft above SL	Per 5kt TW	Per 10°C ABOVE ISA	Per 1% Down Slope	Per Thrust Reverser Operative
SHUTDOWN (if no damage)	3	5	2 080	- 80	+ 150	+ 120	+ 80	+ 210	+ 70	+ 90	- 70

FLAPS LEVER for LDG: CONF 3

REF DIST (190T) = **2080 m**

Weight correction (190T): NO CORRECTION

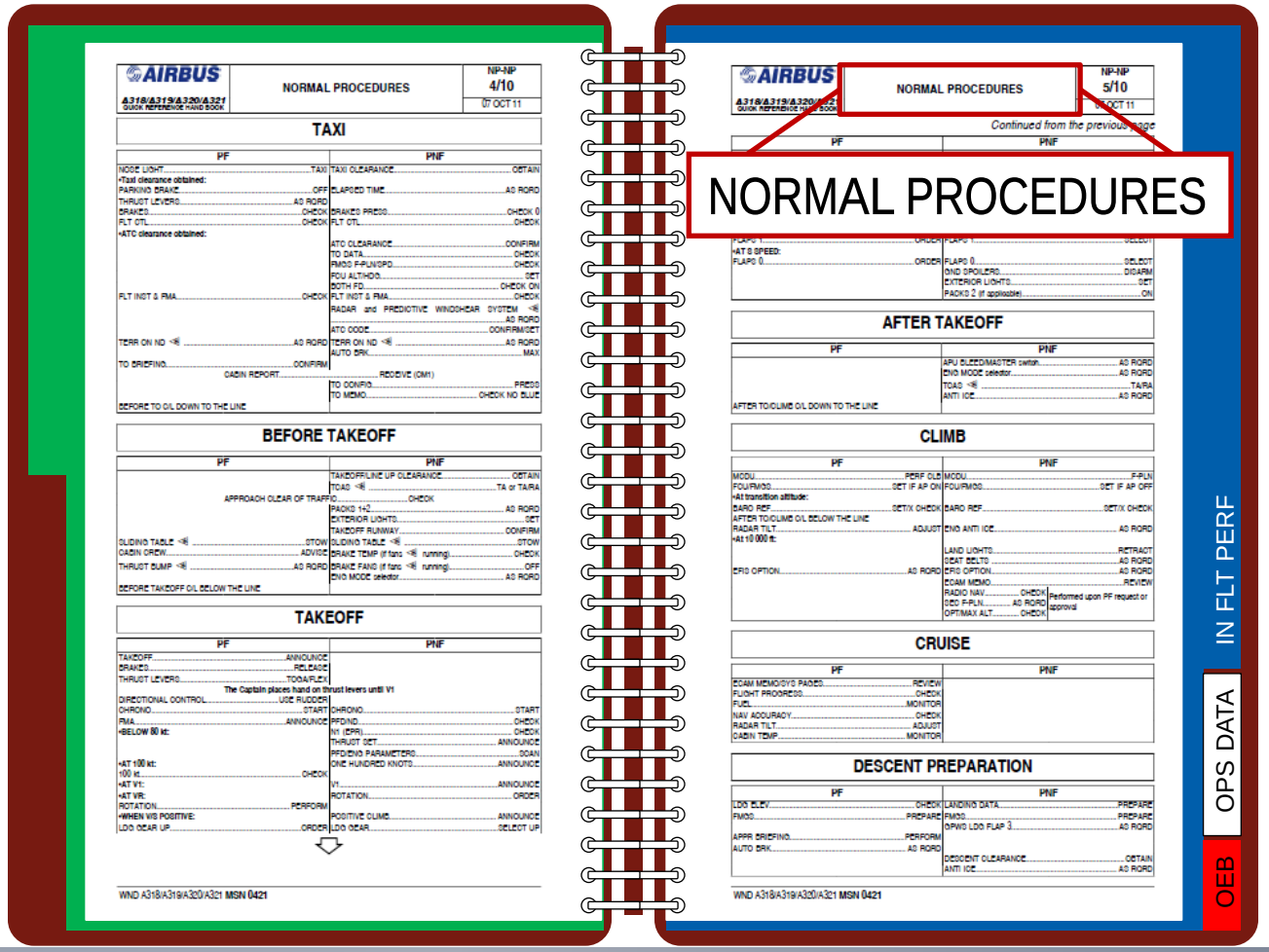
SPD correction (SPD = 5kt) = **+ 120 m**

ALT correction (1000ft) = + 80 x 1 = + **80 m**

REV correction = - 70 x 1 = **- 70 m**

Landing Distance = 2210 m

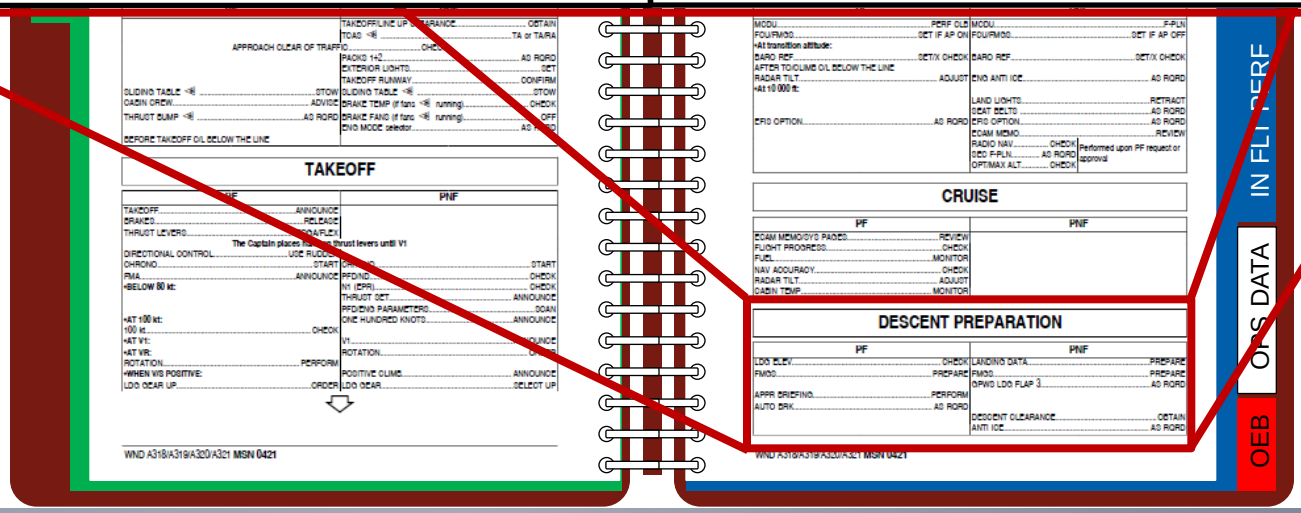
WHAT IS NEW? – STANDARD OPS PROCEDURES



WHAT IS NEW? – STANDARD OPS PROCEDURES

DESCENT PREPARATION

PF	PNF
LDG ELEV ..... CHECK	LANDING DATA ..... PREPARE
LANDING PERFORMANCE ..... CONFIRM	
FMGS ..... PREPARE	FMGS ..... PREPARE
APPR BRIEFING ..... PERFORM	
AUTO BRK ..... AS RQRD	DESCENT CLEARANCE ..... OBTAIN
	ANTI ICE ..... AS RQRD



CONTENTS

Additional Safety Margin

- In-flight landing distance considers fixed flight parameters, without margin
- To cover variability in flying techniques and unexpected conditions at landing the flight crew should apply an appropriate margin to the in-flight landing distances
- Airbus recommends to add a margin of 15% to the in-flight landing distance (except in emergency)

Factored Landing Distance = In-flight Landing Distance x 1.15

ADDITIONAL SAFETY MARGIN

- In-flight landing distance considers fixed flight parameters, without margin

- To cover variability in flying techniques and unexpected conditions at landing the flight crew should apply an appropriate margin to the in-flight landing distances

- Airbus recommends to add a margin of 15% to the in-flight landing distance (except in emergency)

Factored Landing Distance = In-flight Landing Distance x 1.15

To be defined by airline policy

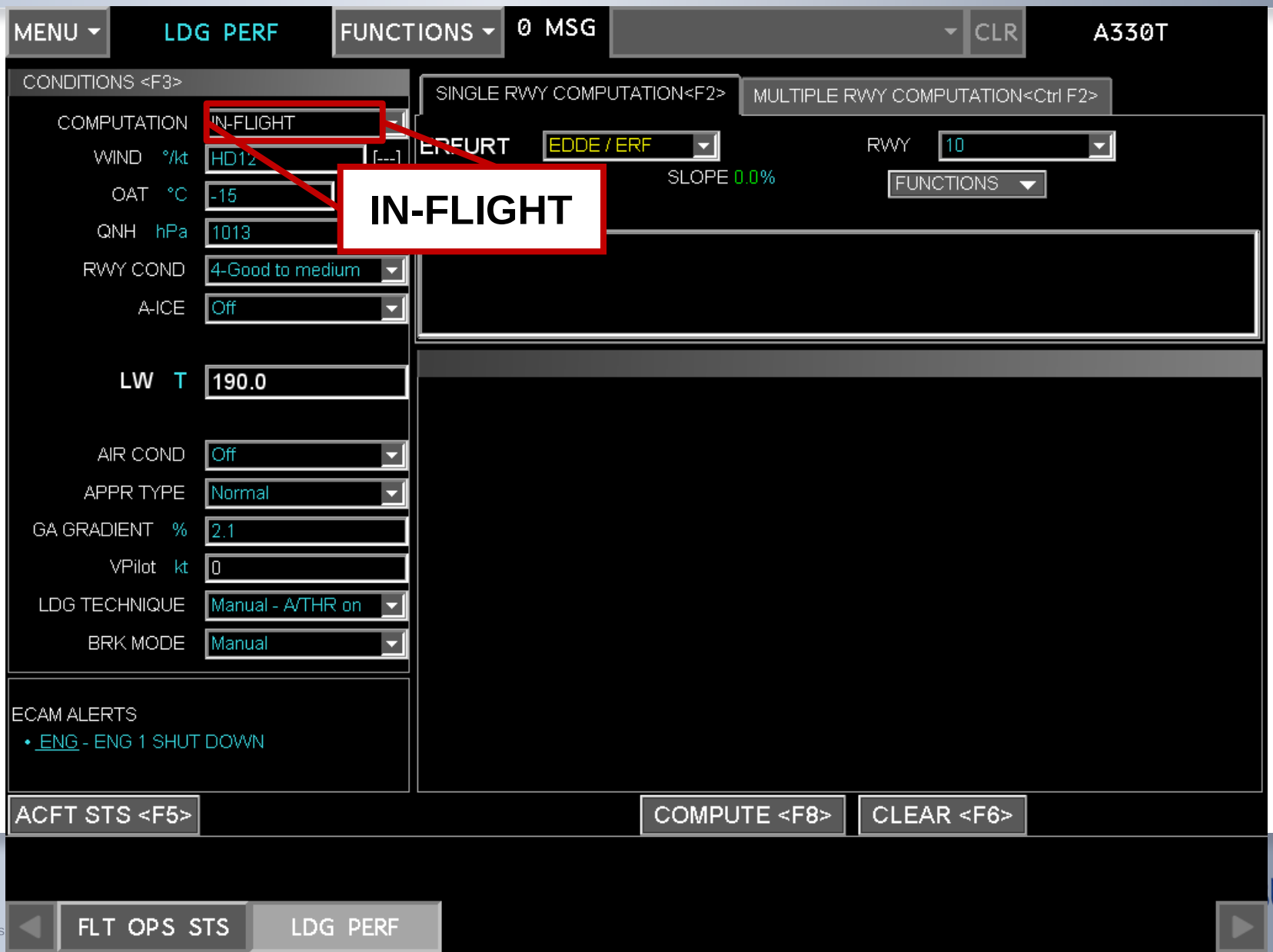
CONTENTS

EXAMPLE WITH FAILURE

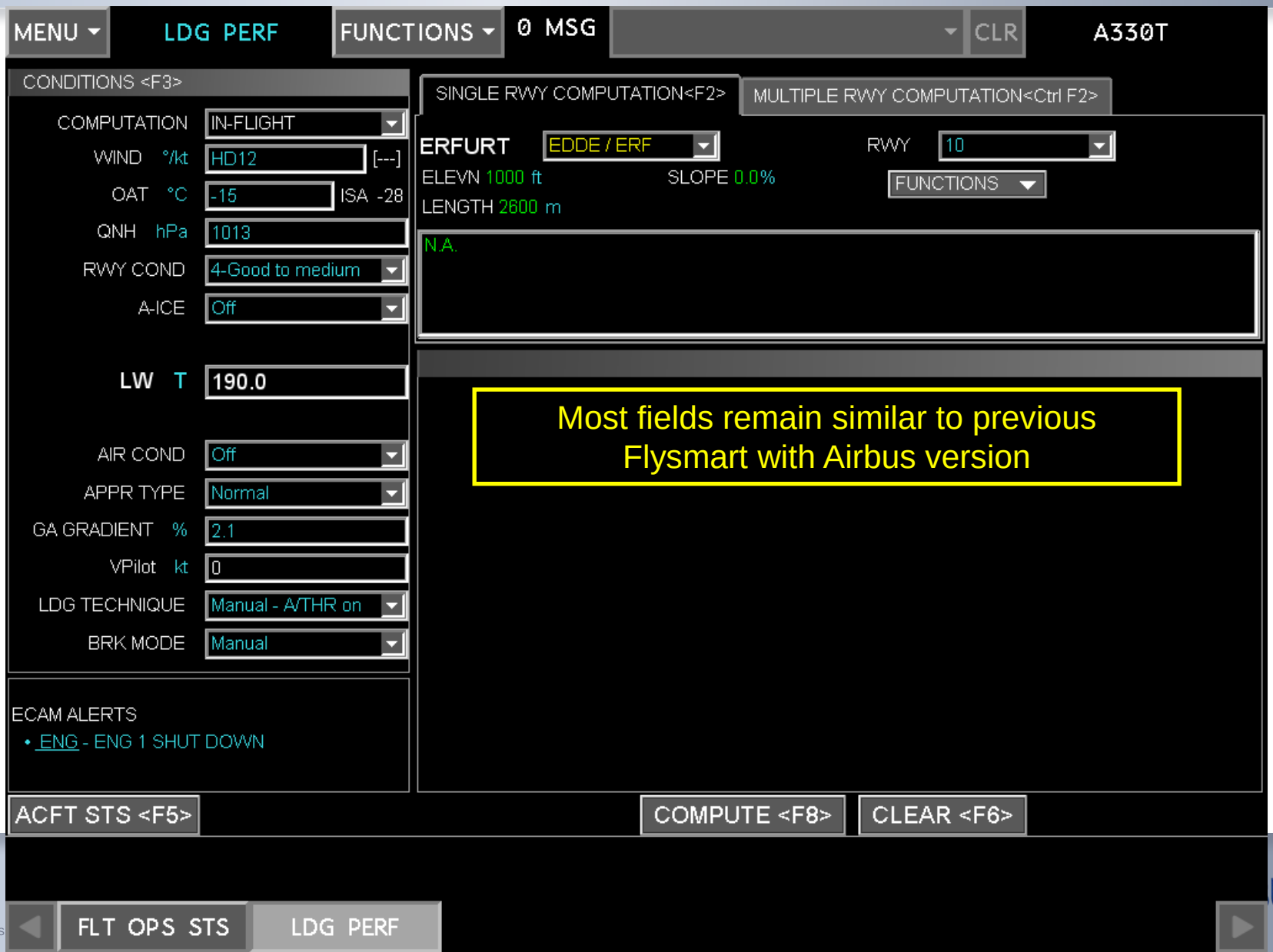
Landing data

- Aircraft **A330**
- Runway Condition **Compacted snow**
- Reported Braking Action **Good**
- Wind / OAT **12 kt headwind / - 15°C**
- Airport pressure altitude **1000ft**
- Estimated Landing Weight **190 t**
- A/THR **ON**
- In-Flight failure **ENG 1 SHUTDOWN** (no damage)
- Credit for all available thrust reversers

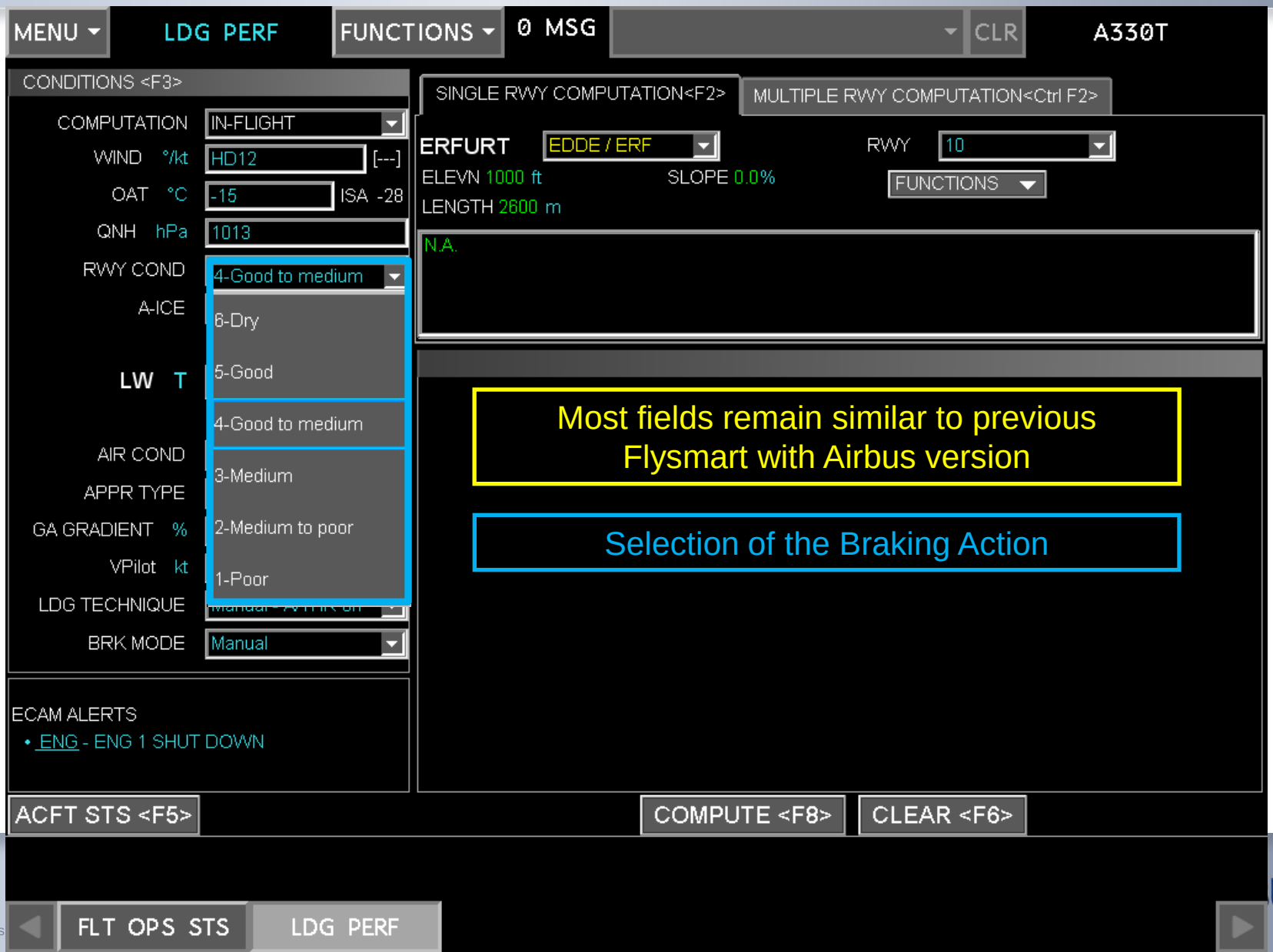
FLYSMART WITH AIRBUS – EXAMPLE **WITH** FAILURE



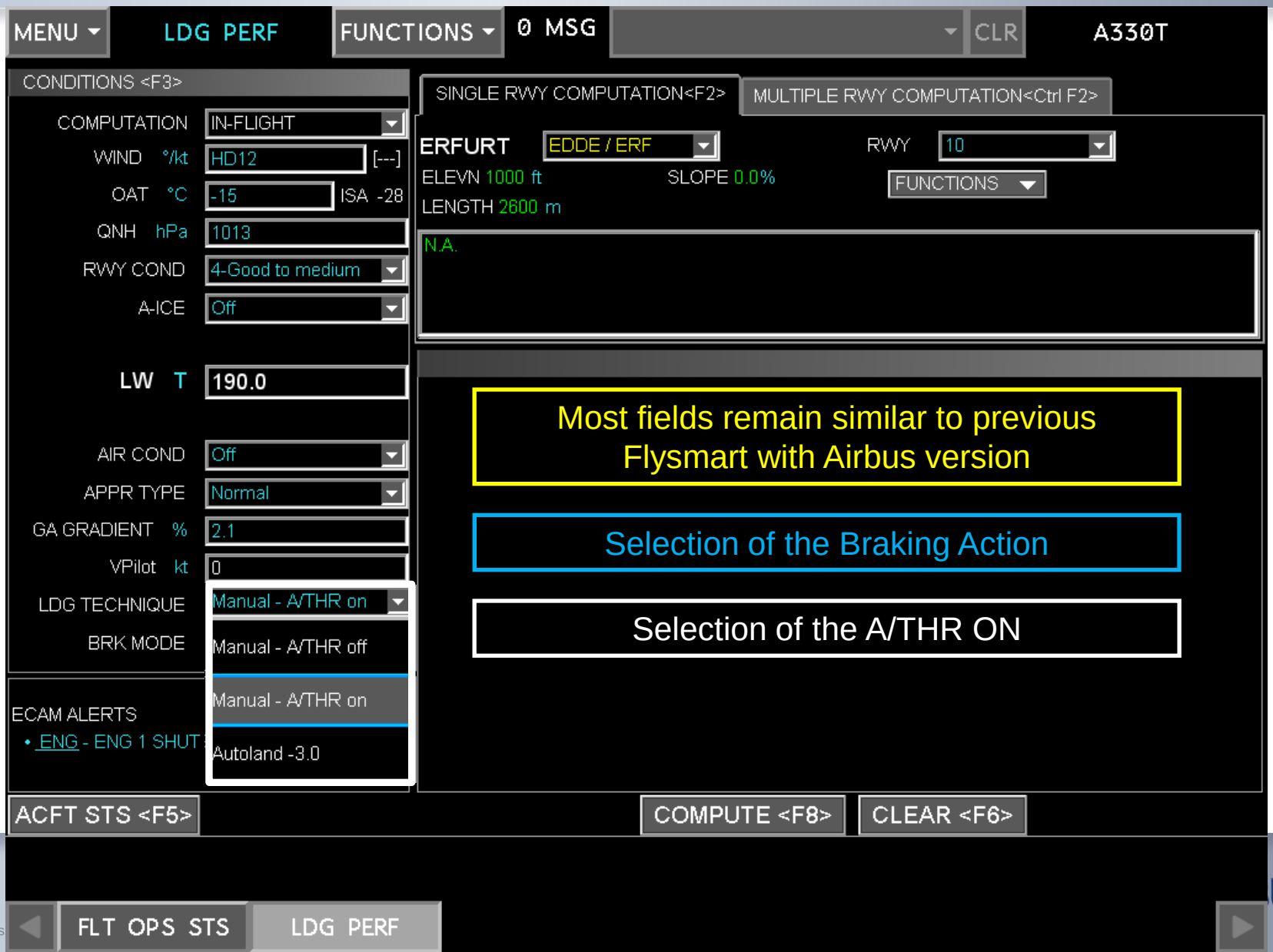
FLYSMART WITH AIRBUS – EXAMPLE **WITH** FAILURE



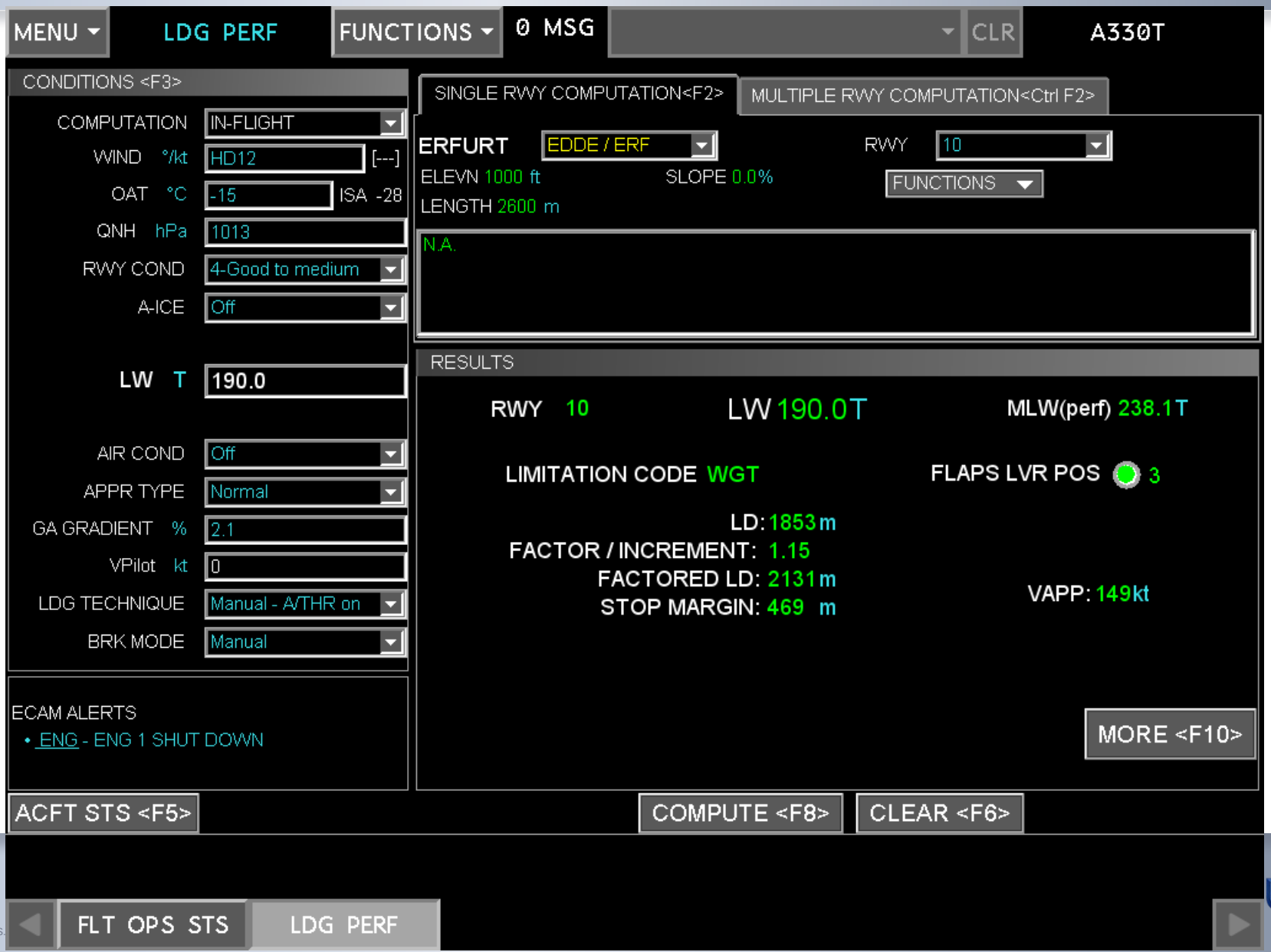
FLYSMART WITH AIRBUS – EXAMPLE **WITH** FAILURE



FLYSMART WITH AIRBUS – EXAMPLE **WITH** FAILURE



FLYSMART WITH AIRBUS – EXAMPLE **WITH** FAILURE



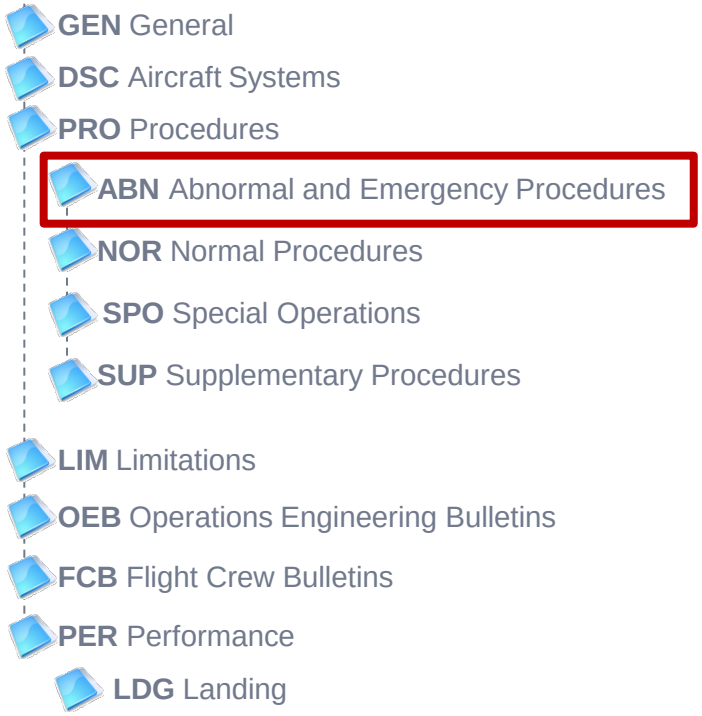
CONTENTS

WHAT IS NEW? - SUMMARY

- The aim of the **TALPA/ARC*** was to elaborate common tools to better assess the in-flight landing performance
  - The **R**unway **C**ondition **A**ssessment **M**atrix (RCAM)
  - The New landing performance without failure
  - The New landing performance with failure

* Takeoff and Landing Performance Assessment / Aviation Rulemaking Committee

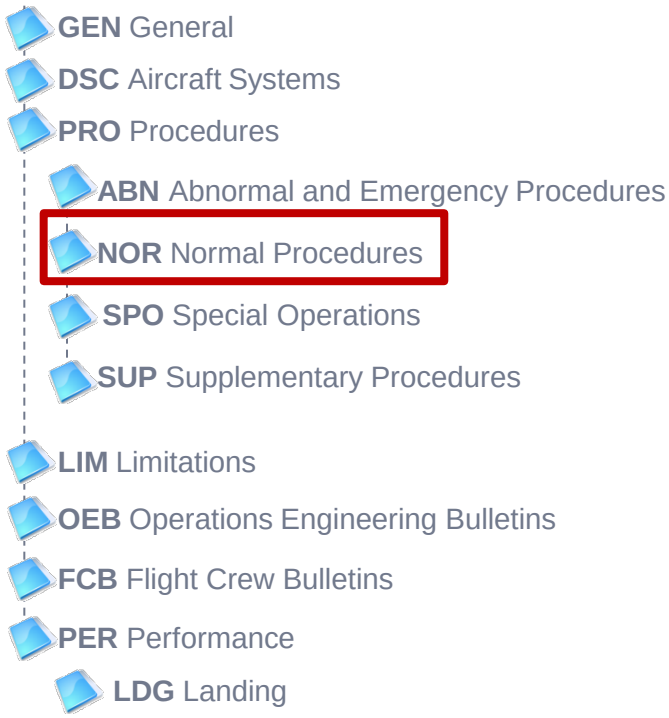
FCOM IMPACTS - REVISION MAY 2012



All references* to the landing distance penalty factors are removed

* Reference to the tables of landing distance penalty factors and the tables are removed

FCOM IMPACTS - REVISION MAY 2012



Descent Preparation updated

FCOM IMPACTS - REVISION MAY 2012

- **GEN** General
- **DSC** Aircraft Systems
- **PRO** Procedures
  - **ABN** Abnormal and Emergency Procedures
  - **NOR** Normal Procedures
  - **SPO** Special Operations
  - **SUP** Supplementary Procedures
- **LIM** Limitations
- **OEB** Operations Engineering Bulletins
- **FCB** Flight Crew Bulletins
- **PER** Performance
  - **LDG** Landing

Introduction of:
Definitions,
Runway **C**ondition **A**ssessment **M**atrix

QRH IMPACTS - REVISION MAY 2012

- **GEN** General
- **ABN** Abnormal and Emergency Procedures
- **NP** Normal Procedures
- **FPE** In-Flight Performance
  - **SPD** Speeds
  - **FPF** Fuel Penalty Factors
  - **IFL** In-Flight Landing
    - **MAT** Runway Condition Assessment Matrix
    - **VAP** VAPP Determination
    - **LD** Landing Distance – Normal Operations
    - **VAF** VAPP Determination with Failure
    - **24** Landing Distance with Electric System Failure
    - **27** Landing Distance with Flight Control System Failure
    - **XX ….**
    - **34** Landing Distance with Navigation System Failure
    - **36** Landing Distance with Bleed System Failure
    - **70** Landing Distance with Engine System Failure
  - **OEI** One Engine Inoperative
  - **AEO** All Engines Operative
  - **CAB** Flight Without Cabin Pressurization
  - **OPD** Operating Data
- **OPS** Operational Data
- **OEBPROC** Operations Engineering Bulletins

All references to the landing distance penalty factors are removed

"Summaries" provide reference to the Landing Distance tables

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Descent Preparation updated

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Introduction of the new landing performance assessment tools

Tables of **A**ctual **L**anding **D**istances are removed

FCTM IMPACTS - REVISION MAY 2012

- **NO** Normal Operations
  - Cruise
  - Descent Preparation
    - Landing Performance
    - Approach Preparation
    - Approach Briefing
  - Descent
- **SI** Supplementary Information
  - **SI-080** Landing Performance
    - Use of Matrix
    - Normal Operations
      - VAPP Determination without Failure
      - Landing Distance without Failure
      - Example
    - Abnormal Operations
      - VAPP Determination with Failure
      - Landing Distance with Failure
      - Example

Guidelines on how to assess landing performance

FCTM IMPACTS - REVISION MAY 2012

- **NO** Normal Operations
  - Cruise
  - Descent Preparation
    - Landing Performance
    - Approach Preparation
    - Approach Briefing
  - Descent
- **SI** Supplementary Information
  - **SI-080** Landing Performance
    - Use of Matrix
    - Normal Operations
      - VAPP Determination without Failure
      - Landing Distance without Failure
      - Example
    - Abnormal Operations
      - VAPP Determination with Failure
      - Landing Distance with Failure
      - Example

"How to use" and examples

AFM IMPACTS - REVISION JUNE 2012

- Approval Data
- General
- Limitations
- Emergency Procedures
- Abnormal Procedures
- Normal Procedures
- Performance
- Appendices and Supplements
- Master Configuration Deviation List
- Supplementary Performance

Reference to relevant file that enables landing distance computation is added

Landing distance with failure superseded the landing distance penalty factors

MMEL IMPACTS - REVISION JULY 2012

- How to Use
- MMEL Entries
- MMEL Items
- MMEL Operational Procedures

Clarify that landing distance penalty factors apply on Required Landing Distance and on In-Flight Landing Distance

FLYSMART IMPACTS

- Class 1 - TBD
- Class 2 - TBD
- Class 3 - TBD