

**Airbus China Safety Conference**  
**Chengdu, 15-16 July 2015**

## **Rejected Take-Off above VR**

Event update

Presented by Albert URDIROZ



## Preliminary

- This event is being investigated in accordance with ICAO Annex 13
- The content of this presentation has been approved for release by the NTSB and BEA
- NTSB accident ID DCA14MA081

# Content

- Background
- Event description
- Operational considerations
- Design enhancement

## Background

- A320
- CPT PF / F/O PM
- 3200m long runway
- Take-off run
- V1, VR
- Rejected take-off
- Nose landing gear collapse
- Final stop at the edge of the runway
- Emergency evacuation
- No injuries
- Damaged beyond economical repair
- Official investigation led by the US NTSB, with Airbus as technical advisor



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## Runway data entered in FMS

“FLTXXX”  
Use runway  
27L



Confirm  
Runway 27L

☞ Crew input:

- 27R in FMS

## TAKE OFF

1L	V1	FLP RETR	RWY	1R
	132	F=142	27R	
2L	VR	SLT RETR	TO SHIFT	2R
	136	S=184	[M] 500	
3L	V2	CLEAN	FLAPS/THS	3R
	139	0=198	2/UP2.1	
4L	TRANS ALT		FLEX TO TEMP	4R
	4000		43°	
5L	THR RED/ACC		ENG OUT ACC	5R
	1990/2500		1990	
6L			NEXT	6R
			PHASE >	

Default data / For illustration only

## Change in take-off sequence

“XXX” you are now  
number 2 for take-off  
(previously number 6  
in the queue)

Start engine2  
After start checks  
Commence take-off briefing



# FMS runway revised whilst entering the runway

## ☞ Crew input:

- Late runway change at MCDU (27R ⇌ 27L)

**TAKE OFF**

1L	V1 132	FLP RETR	RWY 27R	1R
2L	VR 136	F=142	TO SHIFT	2R
3L	V2 139	SLT RETR	[M] 500	3R
4L	TRANS ALT 4000	S=184	FLAPS/THS 2/UP2.1	4R
5L	THR RED/ACC 1990/2500	CLEAN	FLEX TO TEMP 43°	5R
6L		O=198	ENG OUT ACC 1990	6R
			PHASE >	

Default data / For illustration only

**TAKE OFF**

1L	V1 □□□132	FLP RETR	RWY 27L	1R
2L	VR □□□ 136	F=142	TO SHIFT	2R
3L	V2 □□□ 139	SLT RETR	[M] [ ]*	3R
4L	TRANS ALT 4000	S=184	FLAPS/THS	4R
5L	THR RED/ACC 1990/2500	CLEAN	[ ] / [ ]	5R
6L		O=198	FLEX TO TEMP F43 [ ]°	6R
			ENG OUT ACC 1990	
			CONFIRM	
			TO DATA*	
			< TO DATA	
			CHECK TO DATA	

Default data / For illustration only

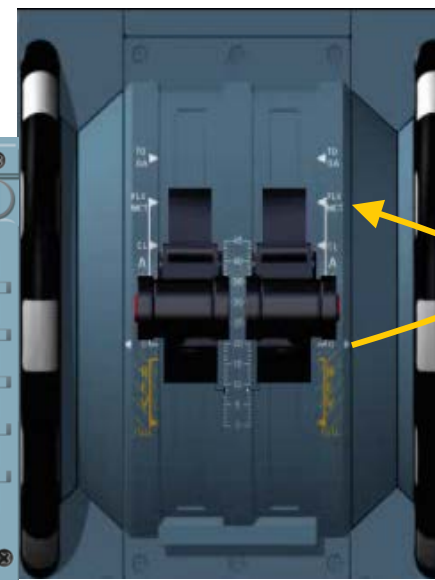
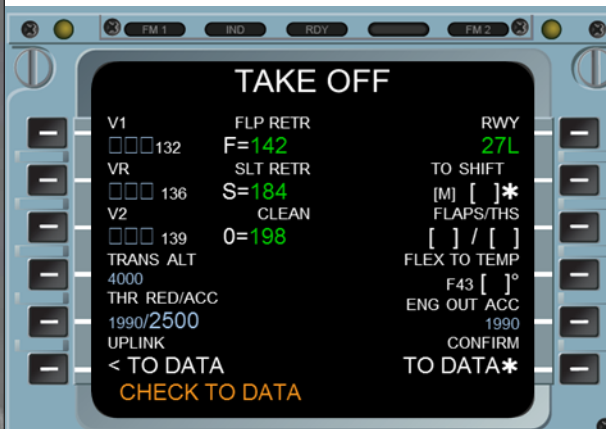
- TO DATA not re-entered



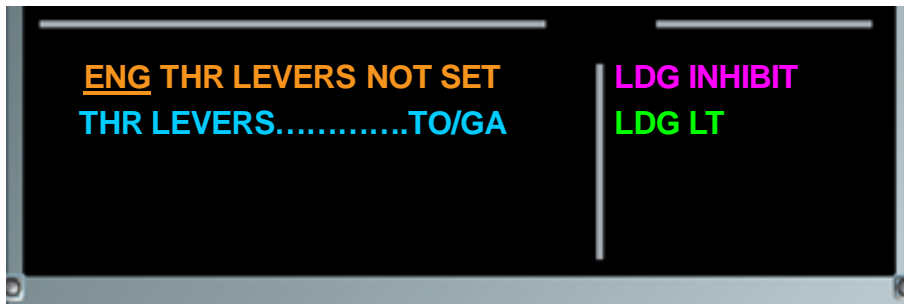
## Sequence of events – Thrust levers

### ☞ Crew input:

- *Thrust levers set to FLX*
  - Without FLX TEMP entered in the FMS, TO modes did not engage
  - Crew noticed V-Speeds were not displayed
  - T/O was continued with the V-Speeds in mind

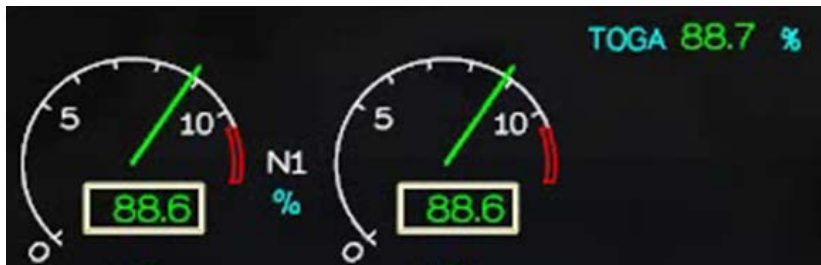
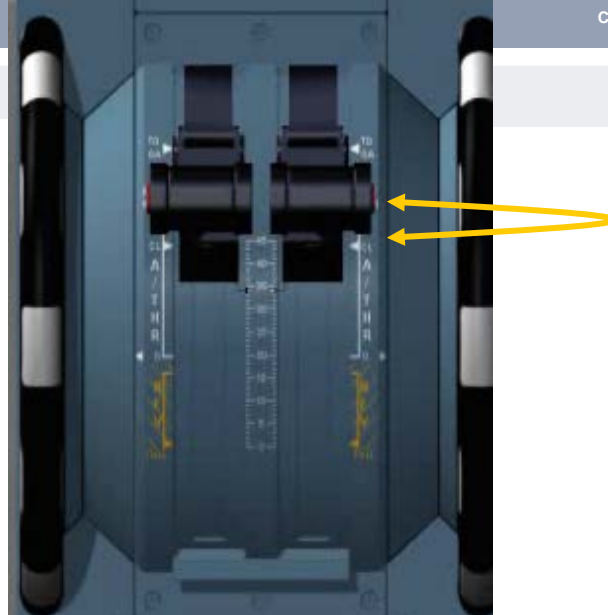


## Sequence of events – Thrust levers



☞ Crew input:

- Levers pulled back and then returned to FLX



- FADEC automatically set TOGA
- TO mode not engaged due to thrust levers setting
- Crew action:
- Crew confirmed TOGA thrust values

## Sequence of events – Above 80kt

- Continuous audio alert “RETARD”

☞ Crew action:

- *Take-off continued*
- *Calls of V1 and VR from memory*
- *Aircraft rotated*
- *T/O rejected*



80kt



V1



VR

RTO

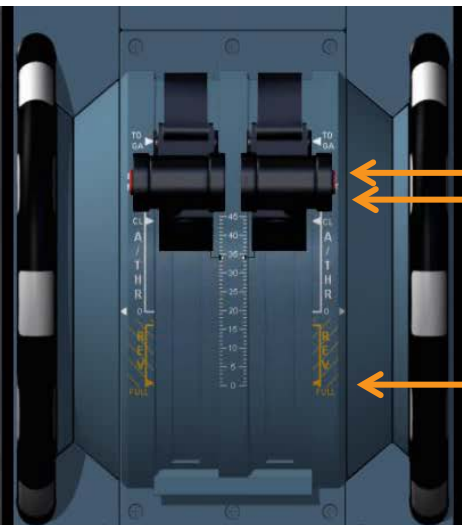


Final stop

# Event replay

FMA  
No TO modes

No V-speeds



Back  
And  
forth

Reject

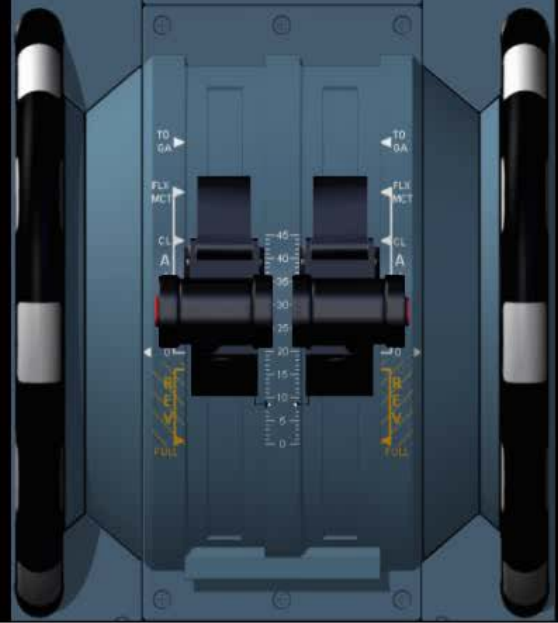
TO PWR

22:21:37 UTC

ENG THR LEVERS NOT SET

AIRBUS





22:21:34 UTC

AIRBUS



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## Operational considerations - Flight and cockpit preparation according to SOP

- *FMGS Preparation*

*F-PLN A page.....COMPLETE AND CHECK*

*FMS PREPARATION..... CHECK*

- *Take-off briefing*

*TAKEOFF BRIEFING.....PERFORM*

- *Before Start Clearance*

*FMS T.O DATA..... CHECK/REVISE AS RQRD*

Extracts from FCOM PRO-NOR-SOP-06/07

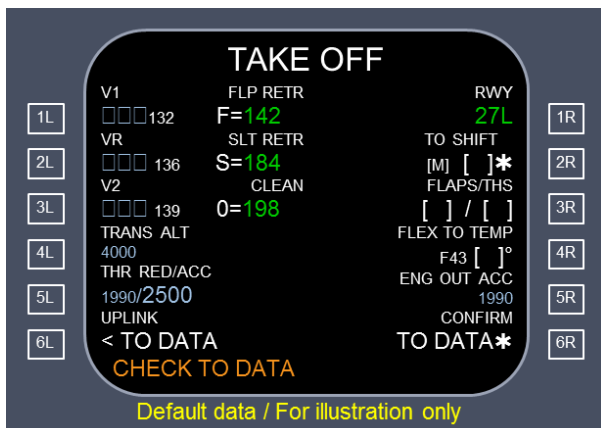
Check / Crosscheck



## Operational considerations - Late changes before take-off

- *Taxi*

*If takeoff data has changed, or in case of a runway change, prepare updated takeoff data, as appropriate*



*F-PLN (Runway)..... REVISE*

*FLAPS lever .....AS APPROPRIATE*

*Select takeoff position*

*V1, VR, V2.....REINSERT*

*FLX TO temperature.....REINSERT*

**Be aware of pre-take-off pressure**

Extract from FCOM  
PRO-NOR-SOP-10



## Operational considerations - Reject or continue?

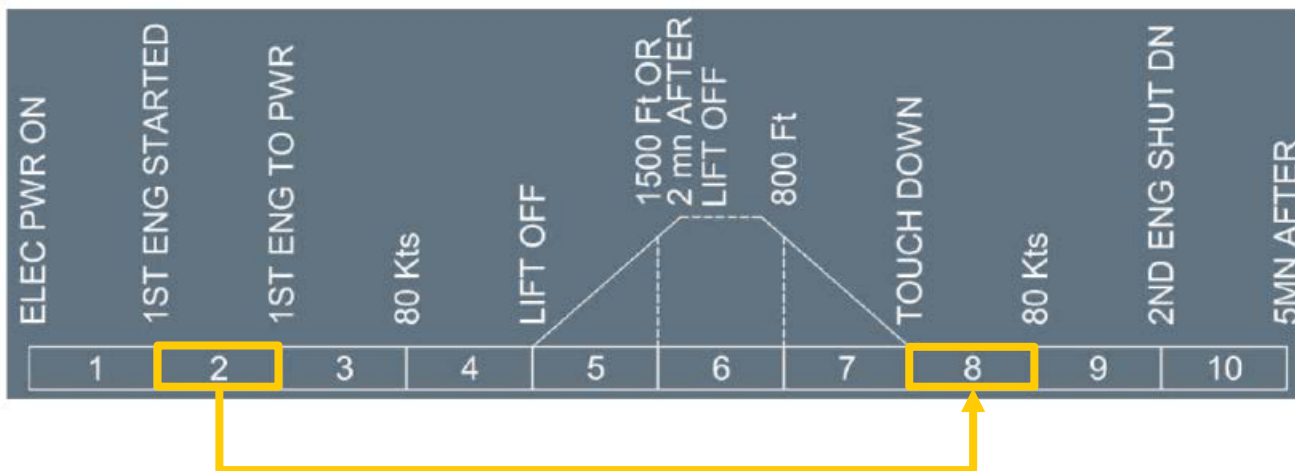
- In the low speed regime (below 100kt per Airbus SOP / 80kt per this Airline SOP)
  - Seriously consider discontinuing the takeoff, if any ECAM warning/caution is activated
- In the high speed regime and below V1
  - Be more “go-minded”
  - Very few situations should lead to the decision to reject the takeoff
- Above V1
  - Takeoff must be continued

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## Why the continuous “RETARD”?

Without take-off thrust setting, FWC did not compute T/O phases (3, 4) but switched from phase (2) to landing phase (8)



1<sup>st</sup> ENG TO PWR: Information taken from thrust lever position

## FWC enhancements considered versus FADEC standards

		Auto-TOGA available	
A/C		A318 / A319 / A320 / A321 / A330 / A340	NEO & A350
MOD1	FADEC	Combination of FWC & FADEC in appendix	Basic
	FWC		
	Principle	FWC to acquire AUTOTOGA condition from FADEC in order to increment Flight Phase: FP 2 → FP 3 or 4 (depending on speed)	

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