



## **NATIONAL TRANSPORTATION SAFETY BOARD**

Office of Aviation Safety  
Washington, D.C. 20594

October 1, 2014

### **Attachment 12 – CLT Simulator Test**

# **OPERATIONAL FACTORS**

**DCA14MA081**

## CHARLOTTE SIMULATOR WORK

On March 26, 2014, the Ops/HP Group conducted several test runs in the USAirways A320 simulator in Charlotte, NC, to document the aural and visual cues associated with a last minute FMC runway change from runway 27R to 27L at PHL (based on the pilot interviews) without inserting the V-speeds or assumed temperature into the FMC, and attempting to takeoff on runway 27L.

### 1.0 Setup

Sim motion: Off  
Position: End of runway 27L  
Route: KPHL-KFLL  
Weight: 152,800 pounds  
OAT: 0°C  
Winds: 302° at 18 knots  
Altimeter: 29.92  
Runway: 27R (initially)  
V<sub>1</sub>/V<sub>R</sub>/V<sub>2</sub>: 157/159/159  
Flex temp: 53°C (initially)  
Runway: Initially runway 27R was entered with V-speeds and assumed temperature, and prior to thrust application, 27L was entered into the FMC via the flight plan page. V-speeds and assumed temperature *were not* reentered in the FMC and were left blank.  
(Note: Each time the runway was changed from 27R to 27L on the flight plan page of the MCDU, a “CHECK TAKEOFF DATA” message appeared in the scratchpad of the MCDU. There was no aural alert or master caution associated with this message.)

### 2.0 A320 Simulator Runs

#### 2.1 Run 1

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Advanced thrust momentarily forward out of the Flex detent, then back
- Aural “retard” alert stopped
- Discontinued takeoff

#### Run 2

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”

- Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Left thrust in Flex, and “retard” aural message continued to liftoff
- Discontinued takeoff

## 2.2 Run 3

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 65 knots, moved thrust to CLM detent, then back to Flex
- No “retard” aural alert sounded
- Discontinued takeoff

## 2.3 Run 4

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Thrust then reduced to CLM detent then back to Flex
- Aural “retard” alert continued to liftoff
- Discontinued takeoff

## 2.4 Run 5

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 65 knots, moved thrust to CLM detent, then back to Flex prior to 80 knots
- No “retard” aural alert sounded
- Discontinued takeoff

## 2.5 Run 6

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- Left the thrust set to Flex
- At about 80 knots, received aural “retard, retard” alert
- Aural “retard” alert continued to liftoff

- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.6 Run 7

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Moved thrust to CLM and back to Flex
- Aural “retard” alert continued to liftoff
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.7 Run 8

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- Left the thrust set to Flex
- At about 80 knots, received aural “retard, retard” alert
- Aural “retard” alert continued to liftoff
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.8 Run 9

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- Left the thrust set to Flex
- At about 80 knots, received aural “retard, retard” alert
- Aural “retard” alert continued to liftoff
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.9 Run 10

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- Left the thrust set to Flex
- At about 80 knots, received aural “retard, retard” alert
- Aural “retard” alert continued to liftoff
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.10 Run 11

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Moved thrust from Flex to CLM then back to Flex
- Aural “retard” alert continued to liftoff
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM.
- Discontinued takeoff

## 2.11 Run 12

- Motion turned on
- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- At about 80 knots, received aural “retard, retard” alert
- Moved thrust from Flex to CLM then back to Flex
- Aural “retard” alert continued
- Rotated at 159 knots and took off
- Aural “retard” alert silenced
- Purple “LDG INHIBIT” message appeared on upper ECAM above 80 knots
- Green “AUTO BRK MAX” message appeared on upper ECAM during takeoff
- Discontinued takeoff

## 2.12 Run 13

- Motion off

- Power set to 50%, then to Flex
- Immediately received Master Caution and chime
  - Amber “ENG THR LEVERS NOT SET”
  - Cyan “THR LEVERS . . . TO/GA”
- Left the thrust set to Flex
- At about 80 knots, received aural “retard, retard” alert
- Pressed EMER CANCEL button and silenced aural “retard” alert

### 3.0 Simulator Photos

#### 3.1 Photos with Runway 27R in FMC (V-speeds and Assumed Temperature inserted)



Photo 1: MCDU with PHL runway 27R inserted in the flight plan page.



Photo 2: MCDU Takeoff page with V-speeds and Assumed Temperature inserted for PHL runway 27R.



Photo 3: PFD with V-speeds inserted.





Photo 4: Upper ECAM with Assumed temperature inserted.



Photo 5: ND display showing PHL runway 27R

3.2 Photos with Runway 27L in FMC (V-speeds and Assumed Temperature not inserted)



Photo 6: Insert prompt for PHL runway 27L.



Photo 7: MCDU Takeoff page with 27L inserted and no V-speeds.



Photo 8: PFD with no V-speeds inserted.



Photo 9: ND Display with 27L shown.



Photo 10: Upper ECAM without Assumed temperature inserted.



Photo 11: PFD without the V-speeds inserted.



### 3.3 Photos with thrust set to Flex (no Assumed Temperature inserted)



Photo 12: Forward displays (with master caution) when Flex thrust set without an assumed temperature.



Photo 13: Upper ECAM when Flex thrust set without an assumed temperature.

3.4 Photo at 80 knots when “retard” aural alert sounded



Photo 14: Upper ECAM when thrust set to Flex without assumed temperature as airplane reaches 80 knots and the “retard” aural alert sounded.