

Report

Serious Incident on **11 January 2010**
At **Lagos Aerodrome (Nigeria)**
To the **Boeing 777-300ER**
Registered **F-GSQI**
Operated by **Air France**

BEA

Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

Ministère de l'Écologie, du Développement durable, des Transports et du Logement

Foreword

This report contains the findings of the BEA on the circumstances and causes of this serious incident.

In accordance with Annex 13 to the Convention on International Civil Aviation, with EC directive 94/56 and with the French Civil Aviation Code, the investigation is not conducted in such a way as to apportion blame or to assess individual or collective responsibility. The sole objective is to draw lessons from this occurrence which may help prevent future accidents.

Consequently, the use of this report for purposes other than prevention could lead to misinterpretation.

SPECIAL FOREWORD TO ENGLISH EDITION

This report has been translated and published by the BEA to make its reading easier for English-speaking people. As accurate as the translation may be, the original text in French is the work of reference.

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Glossary

A/T	Auto Throttle
A/P	Auto Pilot
ATPL(A)	Airline Transport Pilot License (Airplane)
CAS	Calibrated Airspeed
CVR	Cockpit Voice Recorder
DV	Flight Director
EICAS	Engine Indication and Crew Alerting System
FAA	Federal Aviation Administration
FDR	Flight Data Recorder
FL	Flight Level
FMA	Flight Mode Annunciator
FMS	Flight Management System
MCP	Mode Control Panel
PA	Automatic Pilot
PFD	Primary Flight Display
RTO	Rejected Takeoff
TO/GA	Takeoff / Go-Around
UTC	Universal Time Coordinated

Synopsis

Date

 11 January 2010 à 23 h 06⁽¹⁾
Site

 Aerodrome of Lagos
(Nigeria)

Type of flight

 International public transport
of passengers
Scheduled flight AF855

Aircraft

Boeing 777-300ER

Owner

ILFC

Operator

Air France

Persons on board

PNT: 2

PNC: 14

Passengers: 218

⁽¹⁾Unless otherwise specified, the times shown in this report are expressed in Universal Time Coordinated (UTC). One hour should be added to obtain the time in Lagos on the day of the event.

Event	Aborted takeoff at rotation speed
Consequences and damage	Wheels and brakes damaged

1 - HISTORY OF FLIGHT

The Lagos - Paris Charles de Gaulle flight was the final leg in the Paris - Lagos - Port Harcourt - Lagos – Paris rotation. The rotation began in Paris on January 9, and the Port Harcourt - Lagos flight was made on the day of the incident. The crew landed at 21 h 00 on runway 18R in use on the day of the incident.

The stopover lasted approximately 1 hour 30 minutes, during which the Captain wished to quickly prepare the flight for the next leg in order to be able to take a rest period of forty minutes in the cockpit.

The Captain was the pilot flying. The push-back of the plane and engine start up was cleared by the controller at 22 h 50.

The pre-taxiing check-list was performed at 22 h 57. Shortly thereafter, the controller cleared the crew, at its request, to taxi to runway 36L.

Note: The crew of flight AF855 requested to use runway 36L for takeoff because this allowed them to shorten the flight despite the longer taxiing time. The crews of 2 flights departing soon afterwards requested and used runway 18R. The weather conditions enabled use of either runway.

At 23 h 00 min 48, the Captain began the pre-takeoff briefing, and called out the associated speeds: V_1 138 kt, V_R 151 kt, and V_2 157 kt

Departure clearance was transmitted by the controller at 23 h 01 min 31.

At 23 h 02 min 02, the crew of flight Speedbird 74, at the holding point of runway 18R, informed the controller that they were ready to take off. The controller asked them to wait.

The pre-takeoff briefing ended at 23 h 02 min 30. It was immediately followed by the pre-takeoff checklist.

At 23 h 02 min 44, the crew of Speedbird 74 asked the controller whether to expect a long delay. The controller replied that they would be number 2 behind Air France flight 855. The crew of Speedbird 74 indicated that they were ready and had started taxiing before the Air France flight.

At 23 h 03 min 11, the copilot of flight AF855 told the controller that they were ready. At that moment, the aircraft was still on the taxiway, approximately 1,300 meters from the holding point of runway 36L. The controller then cleared them for takeoff.

Approximately 2 minutes later the Captain called out "Takeoff, V_1 138", the aircraft entered the runway and the crew began the takeoff roll without stopping the aircraft.

At 23 h 05 min 24, when N1 had stabilised at 62%, the recorded data show the *TO/GA switches* were pressed. The Captain reported he performed this action. At that moment, the recorded speed of the aircraft was 30 kt (CAS). The positions of the thrust levers and N1 indicator values remained stable.

At 23 h 05 min 27, the Captain stated "*we have a problem...*" and the *TO/GA switches* were recorded as being pressed a second time. Two seconds later, the FDR shows that the auto-throttle was engaged using the MCP switches. At the same time, the FDR shows that the autopilot engage button beside the pilot was pressed twice. The autopilot engaged one second later⁽²⁾.

Note: The Captain explained that when he noted the auto-throttle had not engaged, he temporarily removed his hand from the thrust levers in order to arm it via the MCP.

At 23 h 05 min 33, the Captain reported they had "*no thrust*". The copilot suggested "*do it by hand*" and the Captain replied that he wanted to know why. During this exchange, the thrust levers were advanced to obtain N1 of 92.5%. At 23 h 05 min 37, the copilot said "*press the switches*".

A speed of 80 knots was reached at around 23 h 05 min 42.

At 23 h 05 min 45, the copilot reported that thrust was available. One second later, he announced "*100 knots*". The Captain replied that he had checked the speed and that "*perhaps they had no auto-throttle*". The parameters show that the auto-throttle was armed but not active.

At 23 h 05 min 58, the copilot announced "*rotation*". The aircraft by then had travelled about 1,500 meters. Two seconds later the Captain announced "*abort takeoff*". The CAS recorded on the FDR was then 155 kt. The maximum airspeed of 164 kt was recorded 3 seconds later.

⁽²⁾At this point, the recorded position of the flight director pitch command bar switched from 8° to pitch to a neutral position (0°).

Note: The Captain explained that he made this decision after sensing a blockage in the elevator control when rotating.

The automatic braking system of the aircraft was activated⁽³⁾ and the aircraft stopped about 900 meters from the end of the runway at 23 h 06 min 30.

Due to the presence of aircraft at the holding point of runway 18R, the crew made a U-turn in order to clear the runway.

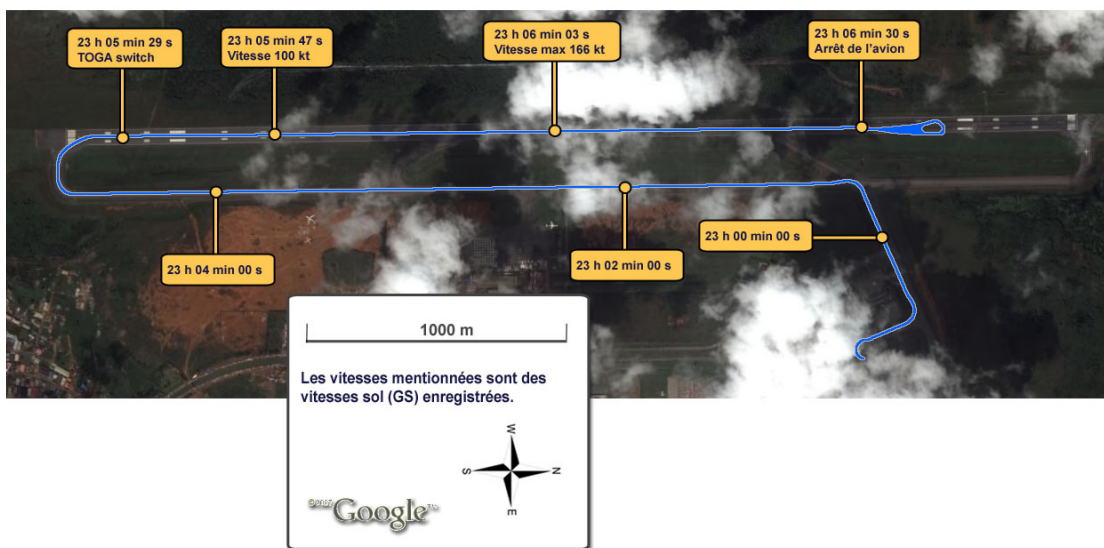
At 23 h 07 min 54, the brake temperature warning was displayed on the EICAS when the brake temperature indicator for wheel number 3 exceeded the threshold value of 5 (on a scale from 0 to 9.9).

At 23 h 08 min 09, the autopilot disconnect alarm was recorded by the CVR. The FDR shows the autopilot was manually disconnected.

At 23 h 10 min 09, to prevent any risk of fire in the wheels, the crew requested the assistance of the airfield fire-fighting services. The fire-fighters from the service followed the aircraft along the taxiways a few minutes after the incident and then sprinkled the brakes with water when the crew arrived at the ramp.

Tire 3 deflated around 23 h 12 min 40, while the aircraft was still on the taxiway, adjacent to its stand. The associated brake temperature indicator reached 8.7⁽⁴⁾. Tires 1, 2, 6 and 4 deflated in turn less than 5 minutes later.

The aircraft arrived at its stand at 23 h 15 min 45.



Partial flight path of F-GSQI calculated from the parameters recorded on the FDR

⁽³⁾In the *RTO* position, the automatic braking of the aircraft is activated when the thrust levers are positioned on *idle* above 85 kt.

⁽⁴⁾The operator specifies in its manual for the aircraft, that the melting range for the thermal fuses begins at 6.4. If this threshold is exceeded, it recommends the aircraft be immediately grounded. It is also specified that the maximum temperature is usually reached approximately fifteen minutes after braking takes place.

2 - ADDITIONAL INFORMATION

2.1 Personnel Information

2.1.1 Captain

Male, aged 54

- ☐ ATPL (A) license issued 10 September 1990
- ☐ Boeing 777 type rating obtained on 13 June 2008
- ☐ Captain since 19 March 2003
- ☐ Other type ratings: Airbus A320, Airbus A330/A340, Boeing 737, Boeing 747-200

Experience:

- ☐ total: 18,385 flight hours, including 4,361 as Captain,
- ☐ on type: 1,067 flight hours, all as Captain.

He explained he had never taken off without the auto-throttle and was disturbed by the fact it did not engage. He added that he had to make a considerable effort to manually view and verify the proper take-off thrust.

2.1.2 Copilot

Male, aged 39

- ☐ ATPL (A) license issued 7 June 2000
- ☐ Boeing 777 type rating obtained on 24 June 2001
- ☐ Other type ratings: Airbus A320.

Experience:

- ☐ total: 8,222 flight hours,
- ☐ on type: 6,104 flight hours.

He reported that he checked the speedometers and the N1 indicator during the takeoff roll.

2.2 Performance on takeoff

Under the conditions on the day of the incident, the manufacturer calculated the following distances:

- ☐ Takeoff distance: 2,555 meters,
- ☐ Accelerate-stop distance at 164 kt: 3,188 meters.

The length of runway 18R/36L used on the day of the incident was 3,900 meters.

2.3 Automated systems

The flight manual for the aircraft indicates (Section 1, page 13) *that the autopilot must not be engaged under the minimum engagement altitude of 200 feet after takeoff.*



Representation of the Boeing 777-300ER MCP



2.3.1 Auto-throttle

The auto-throttle is armed by the 2 A/T ARM switches on the MCP beside the Captain (see the illustration above).

The operator's instructions include arming the auto-throttle during cockpit preparation by the Captain. This item is not included in any checklist. The operations in the *After landing* guide drafted by the operator include disarming of the auto-throttle.

Note: The manufacturer's instructions do not include disarming of the auto-throttle.

It is engaged during takeoff by pressing the TO/GA switches located in front of the thrust levers. It must be engaged before 80 kt. The levers are then automatically positioned to control the thrust indicated in the FMS.

2.3.2 Autopilot

The autopilot is engaged by pressing one of the A/P pushbuttons (see reference 1 in the figure above). Engaging the AP results in the display of A/P on the PFD and the switching on of the green light on the corresponding pushbutton.

When the AP is engaged on the ground, the horizontal and vertical bars of the flight director system are centred.

The AP is normally disengaged by pressing one of 2 disconnect buttons located on the control columns.

Note: A pressure of approximately 18-22 kg applied to the control column also results in the disengagement of the AP.

2.4 Past events and corrective actions

Boeing was notified by operators of 9 cases (possible or actual) of autopilot engagement during taxiing for takeoff between 1999 and 2010. In 8 cases the crew aborted the takeoff. The maximum speed at which a takeoff was interrupted was 170 kt.

In a message issued on 24 February 2009 to all the operators of Boeing 777, Boeing indicated that unintentional manual engagement of the autopilot before takeoff was possible. The engagement of the autopilot significantly increases the effort required on the control column during rotation.

On 22 January 2010 Boeing issued a service bulletin advising of the release of a new software version of the autopilot calculators preventing its involuntary engagement on the ground during the takeoff roll. Air France has applied the service bulletin on its entire Boeing 777 fleet.

The FAA issued an airworthiness directive mandating the implementation of the service bulletin within 90 days from 1 April 2010.

After this serious incident, an internal investigation by Air France recommended that a study be made of their documentation with a view to updating it in order to comply with that of the aircraft manufacturer on the disarming of the auto-throttle.

3 - CONCLUSION

3.1 Findings

- ❑ The crew possessed the licenses and ratings required to undertake the flight.
- ❑ The aircraft had a valid airworthiness certificate.
- ❑ The Captain did not arm the auto-throttle during cockpit preparation.
- ❑ The Captain carried out the cockpit preparation in order to have some time to rest before the departure.
- ❑ The crew decided to use runway 36L for takeoff. The conditions enabled the use of the runway.
- ❑ The controller had a crew wait at the holding point on runway 18R to allow the takeoff of Air France flight 855.
- ❑ The crew reported they were ready for takeoff when the aircraft was about 1,300 meters from the holding point on runway 36L. The controller then cleared them for takeoff.
- ❑ The Captain noticed the auto-throttle did not engage when he pressed the TO/GA switches.
- ❑ The Captain removed his hand from the thrust levers to arm the auto-throttle on the MCP. Without noticing it, he engaged the autopilot while doing so.
- ❑ The crew tried to correct the fact that the auto-throttle had not engaged while the aircraft was accelerating.
- ❑ The Captain considered that the controls were blocked when he tried to take off, and decided to abort the take-off.
- ❑ The maximum speed reached was 164 kt.
- ❑ The aircraft stopped about 900 meters from the end of the runway.
- ❑ The thermal fuses of several tires melted.
- ❑ The operating instructions by the operator for arming and disarming the auto-throttle were different from those of the manufacturer.
- ❑ The manufacturer identified 9 other incidents in which the autopilot was engaged on the ground between 1999 and the date of the event.

3.2 Causes of the incident

This serious incident was due to:

- ❑ the Captain's failure to arm the auto-throttle during cockpit preparation,
- ❑ the Captain's decision to manipulate the auto-throttle switches on the MCP during a critical phase of the flight,
- ❑ the inadvertent engagement of the autopilot during this operation on the MCP,
- ❑ inadequate monitoring of the status of aircraft systems by the crew.

The Captain's decision to advance the cockpit preparation in order to leave time for a rest may have contributed to the failure to arm the auto-throttle.



Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

Zone Sud - Bâtiment 153
200 rue de Paris
Aéroport du Bourget
93352 Le Bourget Cedex - France
T : +33 1 49 92 72 00 - F : +33 1 49 92 72 03
www.bea.aero

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