

Momentary Loss of Control of the Flight Path during a Go-around

⁽¹⁾Unless otherwise specified, the times in this report are expressed in Universal Time Coordinated (UTC).

Aircraft	Boeing 777-200 registered F-GSPP
Date and time	16 November 2011 at 9 h 30 UTC ⁽¹⁾
Operator	Air France
Place	Paris Charles de Gaulle Airport (95)
Type of flight	Scheduled international public transport of passengers
Persons on board	Captain (PF), co-Pilot (PNF), relief pilot
Consequences and damage	None

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.

1 - HISTORY OF FLIGHT

The following elements are based on recorded data (QAR, FDR) and accounts from the flight crew. The CVR, which was safeguarded by the crew, was erased by mistake before it could be read out by the BEA.

The crew reported that the flight was proceeding with no particular problems. The descent was radar vectored to runway 08R at Paris Charles de Gaulle airport. The meteorological conditions led the control service to implement the LVP procedure⁽²⁾.

Due to the visibility, the captain decided to make an automatic category 3 ILS final approach (CAT3). Under these conditions the co-pilot, who was supposed to perform the landing, reverted to PNF (in accordance with the operators procedures and the arrival briefing). The relief pilot was in the cockpit, on the central observers seat.

At 9 h 29 min 39, while the aircraft was established on the glide path and localizer, the amber warning "NO LAND 3" was displayed on the EICAS. The indication "LAND 3" previously displayed in green on the PFD was replaced by ">LAND 2<". The "Master Caution"⁽³⁾ warning was recorded.

At that time, the altitude was 490 ft. The radio altitude was 320 ft. The CAS was 136 kt. The pitch attitude was +1°.

The relief pilot called out "warning" and the PNF called out "go-around".

At 9 h 29 min 47, the PF advanced the thrust levers to the stop in two seconds. He disconnected the auto-throttle (AT). Simultaneously, a nose-up input by the PF on the control column was recorded but it was not strong enough to disconnect the autopilot. The radio height was 250 ft. The CAS was 136 kt.

At 9 h 29 min 48, the pitch decreased and the CAS increased one second later.

Between 9 h 29 min 50 and 9 h 29 min 56, the horizontal stabilizer (THS) began to change position towards a nose-down input (it moved from -0.5° to +1.15°).

⁽²⁾Low Visibility Procedures. When implemented, the spacing between aircraft changes from 95 to 150 seconds, and the number of arrivals per hour is also regulated by the Central Flow Management Unit (CFMU) of Eurocontrol.

⁽³⁾The "Master Caution" display came on for 2 seconds. In normal operation, the visual warning is accompanied by an aural beeper warning.

⁽⁴⁾In normal operation, on disengagement of the AP, a continuous beep sounds when the Master Warning display illuminates. On disconnection of the AP, it sounded for 17 seconds.

At 9 h 29 min 51, the PNF selected flaps 20. The pitch attitude stabilised at around -2° . The relief pilot called out "pitch attitude".

At 9 h 29 min 56, the PF and the PNF almost simultaneously applied a nose-up input. The AP was disengaged⁽⁴⁾. Vertical acceleration reached 1.84 g.

The pitch attitude changed from -2° to $+7^{\circ}$ in 2 seconds then dropped again to $+4^{\circ}$.

Between 9 h 29 min 57 and 9 h 30 the PFs nose-down input and the PNFs nose-up input on the wheel cancelled each other out: the wheel returned to the neutral position. The CAS was 169 kt.

The relief pilot once again said "pitch attitude".

At 9 h 30, the PF stopped attempting to apply a nose-down input and the overall order given by the position of the control column was nose-up. The recorded vertical acceleration was 1.71 g. The pitch attitude changed from $+5^{\circ}$ to $+11^{\circ}$ (in two seconds). The radio altitude reached a minimum value of 63 ft. The CAS was 180 kt. The radio height reached a minimum value of 63 ft then increased. The pitch passed from $+5^{\circ}$ to $+11^{\circ}$ (in two seconds), then from $+11^{\circ}$ to $+19^{\circ}$ (in ten seconds).

At 9 h 30 min 12, the landing gear lever was positioned on "retracted".

The radio height was 870 ft.

The PF followed ATC instructions (4,000 ft on the extended centreline, previously given). He set up the aircraft again for a CAT3 AUTOLAND final approach.

The landing took place without any particular problems.

2 - ADDITIONAL INFORMATION

2.1 Crew Experience

Captain: 14,370 flying hours of which 6,645 on type, last go-around training on 24 October 2011.

Co-pilot: 7,823 flying hours of which 3,258 on type, last go-around training on 4 September 2011.

Relief pilot: 7,490 flying hours of which 5,271 on type, last go-around training on 8 June 2011.

2.2 Meteorological conditions

METAR received on board at 08 h 35:

LFPG 160830Z 11008kt 022 R27L/0400V550N R09R/0500D R26R/1100U R08L/0450N R26L/0550 R08R/0400N R27R/0500N R09L/0400N FG VV// 02/02 Q1019 NOSIG

The "N" ATIS of 8 h 20, received on board at 8 h 36 and "O" of 8 h 57, received on board at 9 h 01 indicated: "Low Visibility Procedures in force activated".

Note: the LVP procedure had been active since 15 November 2012 at 22 h 58 (ATIS C).

2.3 Operator instructions for CAT 3 final approach

According to the currently applicable operational documentation (GENOPS, TU777, QRH), "Regardless of the meteorological conditions, an automatic approach and landing are always possible. However, in both cases the following conditions must be met:

- The aircraft equipment must have LAND2 or LAND3 status;
- The QFU used must have an ILS CAT2/CAT3;
- The automatic landing limitations must be respected;
- The task-sharing must be that of CAT2/3 approaches."

...

"The following events result in a single "WARNING" callout making a go-around mandatory:

- Any audio warning;
- Any Master Warning or Master Caution (display lights on);
- Any degradation in capabilities;
- Any non-compliant flight mode annunciator (FMA) display or excessive deviation below 500 feet."

.....

"The go-around is performed by the captain, the co-pilot monitors the flight path, performs the standard callouts and the announcement to ATC."

...

"In CAT3, the minimum DH is 50 feet in LAND2 and 20 feet in LAND3. The AUTOLAND Status should display LAND2 or LAND3."

2.4 B777 Go-around Procedure

The operators documentation defines the risks associated with a go-around (loss of control, collision with ground or with obstacles) and states that:

"The go-around is a normal, though sensitive, procedure (little real-life situation training, speed of decision and execution. In order to best manage this situation, pilots must anticipate, both in the briefing and throughout the approach, those elements that may lead to a go-around and the potential difficulties of performing it."

"Engagement of the automatic systems before and during the go-around makes it possible to free up resources and to significantly increase pilot availability."

REMISE DE GAZ 2 GTR

La procédure suivante est adaptée à l'utilisation du **pilote automatique**.
 En cas de remise de gaz en pilotage manuel le PF demande les sélections et affichages au MCP, le PNF effectue au MCP les sélections et affichages demandés par le PF.
 Pendant toute la manoeuvre les pilotes vérifient le suivi de la trajectoire et l'interception de l'altitude de RdG.

PF	PNF
La procédure remise de gaz 2 GTR s'effectue volets 20°.	
"REMISE DE GAZ" Annoncée	
Simultanément :	
Poussoir(s) TO-GA Appuyé(s)	
<i>Cette action initialise la prise d'assiette et l'affichage de la poussée automatiquement.</i>	
"VOLETS 20" Commandé	Levier FLAP Cran 20
Assiette de remise de gaz Vérifiée	
Poussée de remise de gaz Vérifiée	
<p><i>NOTE : En cas de remise de gaz en pilotage manuel :</i></p> <ul style="list-style-type: none"> ◦ effectuer la rotation manuellement vers l'assiette de remise de gaz, ◦ sélectionner et vérifier l'application de la poussée de remise de gaz. 	
	Vérifie un vario positif à l'altimètre : "VARIO POSITIF" Annoncé
Vérifie un vario positif à l'altimètre : "TRAIN SUR RENTRÉ" Commandé	
	Manette de train UP
Au-dessus de 400 ft AAL : Sélectionner ou vérifier le mode de guidage latéral.	Vérifier que l'altitude de remise de gaz est affichée au MCP.

⁽⁵⁾No specific value is fixed by the airline's operational texts.

⁽⁶⁾This change in system performance does not prevent automatic landing but increases decision height from 20 to 50 ft (depending on the manufacturer). However, the operator's instructions indicate that during a CAT3 final approach, below 1,000 ft, any alarm or change in modes results in a go-around.

2.5 Pilots Testimony

The crew stated that the flight was calm overall: some storms and turbulence, common on this route.

The arrival procedure under radar vectoring was considered as long. After a long flight (10 h) that arrived at 11 h 00 in the morning (local time), this may have led to a certain loss of vigilance.

However, the crew did not feel tired.

2.5.1 PF

On short final, at about 350 ft⁽⁵⁾, in accordance with instructions, he was looking for external visual references, the PNF dealing with monitoring the flight parameters.

During this phase LAND2 information replaced LAND3⁽⁶⁾.

⁽⁷⁾On approach, descending on the flight path, pushing the TOGA switches leads to selection of go-around thrust guaranteeing a vertical speed of at least 2,000 ft/min, automatic disengagement of all of the previously selected AFDS modes, and automatic engagement of the go-around roll and pitch modes. Pressing a second time leads to selection of maximum thrust.

The warning was called out by the relief pilot and the PNF called out “go-around” (since the warning callout had already been made).

The PF stated that he pushed the AT disconnect switch, located on the throttle levers, unintentionally and by mistake, instead of pushing the TOGA engagement switches⁽⁷⁾. He then moved the throttle levers towards maximum thrust. He explained that he made a visual go-around and that he did not have the impression of any increase in pitch attitude before pulling back on the control column.

He saw the ground at 250 ft. Having visual references and, knowing that the landing was possible, his plan of action was to land. The NOLAND3 warning, making mandatory a go-around, led to confusion and to a change in his plan of action. He thus progressively moved the throttle levers forwards.

The PF added that the AP disengaged. He did not know if this resulted from pushing the autopilot disconnect switch or the pitch-up input on the control column. The landing gear was retracted at about 400 ft.

2.5.2 PNF

The copilot said that he did not monitor the pitch attitude after the go-around order as he was handling the change in configuration (flaps 20).

The go-around pitch attitude was adopted late, after the “pitch attitude” callout by the relief pilot.

2.5.3 Relief Pilot

The relief pilot stated that when the NO LAND3 appeared on the EICAS, there was no reaction from the flight crew. In his position, it was difficult to intervene in the work of the flight crew in place. However, it seemed to him that the PNF saw the change of status. The relief pilot called out “Warning” (in accordance with the procedure with any modification below 1,000 ft in CAT3). The PNF called out “Go-around”. The relief pilot saw PNF gestures that were compatible with a go-around (power up or following the throttle levers).

During the visual circuit (copilots PFD), the relief pilot saw G/S on the FMA and pitch attitude that remained low. He then called out “pitch attitude” once. The captain reacted with a nose-up input. As the pitch attitude did not seem satisfactory to the relief pilot, he called out “pitch attitude” again. There was a double nose-up input and the pitch attitude of the aeroplane was satisfactory (compatible with that of the go-around).

2.6 Study of Parameters

Based on the recorded parameters and the witness accounts, the incident had four phases:

2.6.1 Phase 1: alarm and reaction of the crew, between 9 h 29 min 39 (appearance of the NO LAND3 warning) and 9 h 29 min 47 (forward movement of the throttle levers).

The relief pilot noted the alarm and called it out. The PNF called out “go-around”. The PF moved the throttle levers forward and made a small nose-up input on the wheel. The wheel did not change position since the PF was only countering the AP order that was trying to keep the aeroplane on the ILS trajectory.

In this 8-second phase, it can be supposed that there was a delay in the power up action (2 to 3 seconds), even if the orders/callouts/reactions/inputs were undertaken by three people. It is likely that the PF, intent on his "landing" plan of action (external visual references, more concentration on the instruments – given to the PNF – knowledge of aeroplane performance- possibility of an automatic landing with decision minimums increased) may have had difficulty in refocusing his resources on the go-around. The error he made may reflect the conflict of information in the decision taken by the PF at this time.

No witness account indicates a check was made of the engine parameters.

2.6.2 Phase 2: Lack of crew action and deviation callouts (between 9 h 29 min 47 and 9 h 29 min 56).

In this phase which lasted 9 seconds, the pitch attitude of the aircraft decreased and became negative, while its speed increased, and the efforts to apply a nose-up input by the PF on the control column were insufficient to disconnect the autopilot. There was no change in mode on the FMA. The AP kept the aircraft on the ILS centrelines and applied a nose-down input on the THS.

The flight crew did not monitor the parameters and did not intervene to change the flight path. The crew lost control of the flight parameters.

It is likely that the PF did not take into account all of the information coming from the PNF and did not entirely focus his resources on the go-around.

It seems that the PNF focused his resources more on progress in retracting the flaps (which takes about ten seconds) than on monitoring flight parameters.

2.6.3 Phase 3: first "pitch attitude" call-out (between 9 h 29 min 56 and 9 h 30).

In this phase which lasted 4 seconds, the two pilots acted simultaneously on the elevator control. Both pilots applied a nose-up input, probably in response to the "pitch attitude" callout of the relief pilot.

Both pilots made a pitch up input for about 2 seconds. The AP disconnected. The maximum vertical acceleration was reached (1.84 g).

The PNF constantly applied a nose-up input while the PF did exactly the opposite.

The pitch attitude remained insufficient for a go-around manoeuvre. Its maximum value recorded was +7° and it switched almost immediately to +4°.

Speed continued to increase. The aircraft only climbed approximately thirty feet. During this phase, there were no deviation callouts by the PNF or any monitoring of the flight parameters by the flight crew.

2.6.4 Phase 4: go-around

At 9 h 30 min after the second "pitch attitude" callout from the relief pilot, the PF relaxed his effort to apply a nose-down input on the control wheel. The fact that the PNF continued to apply the nose-up input gradually resulted in a nose-up attitude suitable for the go-around manoeuvre.

The PNF stopped his inputs on the elevator control.

None of the three crew members reported any audio warning in any of the three phases.

2.7 Step Taken

After the incident, prevention information relating to go-arounds with no TOGA selection was distributed among B777 sector pilots.

3 - CONCLUSION

This serious incident was due to the inadequate monitoring of flight parameters by the flight crew.

The following factors contributed to this:

- Partial execution of the go-around procedure;
- Inadequate management of the automatic systems during execution;
- The conflict of plans of action between respecting the operators instruction and continuing the landing, which seemed to be safely possible according to the manufacturer.

4 - ADDITIONAL INFORMATION

At the end of 2010, the BEA launched a study on the loss of flight path control in the approach phase during go-arounds (ASAGA). The study was published in 2013.