

SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 757-2T7, G-MONK	
No & Type of Engines:	2 Rolls-Royce RB211-535E4-37 turbofan engines	
Year of Manufacture:	1988	
Date & Time (UTC):	13 December 2008 at 1045 hrs	
Location:	On approach to London Gatwick Airport, West Sussex	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 8	Passengers - 78
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	51 years	
Commander's Flying Experience:	10,350 hours (of which 6,750 were on type) Last 90 days - 81 hours Last 28 days - 23 hours	
Information Source:	AAIB Field Investigation	

Synopsis

During an approach, in demanding weather conditions, the crew inadvertently left the speedbrakes deployed with the auto-throttle disengaged; the aircraft's speed decayed until the stick shaker activated. The Quick Reference Handbook (QRH) actions for stick shaker activation were not completed properly and during the go-around the speedbrakes remained extended. Subsequently, the Flight Director Pitch Bars disappeared from the Primary Flying Displays (PFDs) and the commander became disorientated. He handed over control to the co-pilot and stowed the speedbrakes realising that they were still deployed. The crew subsequently completed an uneventful ILS and landed safely.

History of the flight

The commander and co-pilot reported for duty at 0430 hrs for a return flight from Gatwick (LGW) to Innsbruck. They had flown together previously and each had a high regard for the other's abilities. For the commander this was his first flight in three weeks, and for the co-pilot his first flight in two weeks. During the previous week, the crew had both flown simulator checks on the procedures for Innsbruck.

The operator required the commander to perform both the landing and the takeoff at Innsbruck. It was therefore decided that the co-pilot would be the pilot flying (PF) for the outbound leg from LGW, handing over to the commander for the landing at Innsbruck. The commander would then be the PF for the return leg and

the approach, with the co-pilot performing the landing at LGW. Having checked the weather information, the crew decided on a 30 minute delay to ensure that the weather was suitable for their arrival at Innsbruck. The outbound flight from LGW, the turnaround and departure from Innsbruck were all uneventful and the aircraft was back on schedule as it approached LGW.

The weather was wet and windy; the surface wind was recorded as 14 kt gusting to 26 kt from the south east. Runway 08R was in use, and aircraft were being radar vectored to intercept the ILS from the south. The wind at 2,000 ft was 50 kt from the south.

At 1040 hrs, ATC advised the crew that they had 28 track miles to run. The aircraft was becoming a little high on the approach profile so the co-pilot reminded the commander about the strong tailwind on base leg; the commander deployed the speedbrakes.

At 1044 hrs, the final approach controller asked the crew to slow to 180 kt and, shortly afterwards, gave them instructions for the final turn to intercept the ILS. This instruction was issued when the aircraft was approximately 8.5 nm from touchdown and displaced 2.4 nm to the south of the ILS centreline; the Mode S showed the aircraft's speed as 190 kt at this time¹. There was a pause of a few seconds before the aircraft began its turn, following which it was cleared to descend to 2,000 ft, and then to descend further with the ILS.

The commander tried different autopilot modes in an attempt to reduce the airspeed, but the aircraft was

high on the approach profile. The crew therefore lowered the landing gear to increase the aircraft's drag and subsequently its rate of descent. The co-pilot then prompted the commander that the localiser (LOC) selection on the Mode Control Panel (MCP) had not yet been armed. As soon as it was selected, the autopilot captured the localiser; however, it was too late to prevent the aircraft from flying through the ILS centreline. Localiser capture however, was still active and the autopilot turned the aircraft onto a heading of 145° to intercept the ILS centreline from the north.

The commander was now concerned that, as he should not capture the glide slope until fully established on the localiser, the autopilot would go into ALT CAPTURE mode and level the aircraft at 2,000 ft. To prevent this from happening he disconnected the autopilot and flew the aircraft manually onto the ILS, whilst the co-pilot changed the radio to the tower frequency, reset the MCP altitude and signalled the cabin crew to take their seats for landing. The commander then instructed the co-pilot to re-engage the autopilot. As the co-pilot was concerned that the airspeed was decaying below the Flap 5 speed, he prompted the commander, and selected Flap 20.

A short time later, the stick shaker activated. The commander immediately lowered the aircraft's nose and increased engine thrust. The airspeed increased and the stick shaker stopped, but the crew decided that the best cause of action was to go-around. The commander therefore ordered a go-around and pressed the Take-Off Go-Around (TOGA) button.

The commander increased the pitch attitude, the co-pilot called a 'positive climb' but the commander did not respond. After repeating the call, the co-pilot raised the landing gear and advised ATC that they were

Footnote

¹ The preceding aircraft had been given the same turn from a position of 9 nm from touchdown and displaced by 2.7 nm, with a Mode S speed of 180 kt, enabling the aircraft to intercept the localiser directly.

going around. The commander called for Flap 5 but the co-pilot cautioned that the speed was still too low. The commander was now becoming confused as the aircraft attitudes did not appear normal, and the aircraft was not responding in the usual manner. The Flight Director pitch guidance had disappeared from the commander's and co-pilot's PFDs and, aware that he was becoming disorientated and that the co-pilot seemed to have a better situational awareness, he instructed the co-pilot to take control. The co-pilot did so and lowered the nose.² The commander subsequently realised that the speedbrakes were still extended and retracted them.

The second approach was initially flown by the co-pilot, but control of the aircraft was handed back to the commander for the landing, who, by then, had regained his situational awareness.

Recorded information

The Flight Data Recorder (FDR) was removed from the aircraft and taken to the AAIB to be downloaded and analysed. The recordings on the Cockpit Voice Recorder (CVR) during the incident had been over written with more recent recordings.

Data downloaded from the FDR is shown in Figure 1. The data starts about 30 seconds after both the autopilot and auto throttle have been disengaged on the approach to LGW. The aircraft is at 2,400 ft pressure altitude, descending at 140 kt computed airspeed and slowing with the flaps extending to Flap 20 and the speedbrakes out. The engines are at a nominal Engine Pressure Ratio (EPR) of 1.10 and nose-down pitch trim was being manually applied.

As the flaps reached Flap 20, the autopilot was re-engaged. The aircraft continued to descend and slow; however, no further nose-down pitch trim was applied apart from one small burst (ie less than one second in duration). The pitch attitude then started to increase, from a nominal 7° nose-up, reaching 10° about 13 seconds later as the airspeed slowed to 123 kt. The angle of attack (alpha) was also increasing, and as the pitch reached 10°, the rate of increase for both alpha and pitch rose sharply. As alpha passed through 10.3° (the stall warning threshold for Flap 20), at a height of about 1,000 ft, the stick shaker activated and the autopilot disengaged. The stick shaker stayed active until the aircraft's pitch attitude was reduced and thrust applied: it was active for no more than two seconds. The speedbrakes remained extended.

About six seconds later, with the speedbrakes still out and as the aircraft accelerated to about 150 kt, the TOGA button was pressed. The aircraft continued to accelerate to 158 kt before slowing as it pitched up and climbed away. During the climb the maximum recorded nose-up pitch attitude was 28° (although the alpha was only about 2°) and the minimum recorded airspeed was 125 kt. The rest of the climb was uneventful, and, as the aircraft passed through 3,600 ft pressure altitude, the speedbrakes were retracted; 70 seconds after the stick shaker first activated.

Flight crew training records

An examination of the flight crew training records showed that both pilots were appropriately qualified and licensed and that they normally operated the aircraft to the required high level of proficiency. The commander had, until recently, been employed by the operator as a line training captain.

Footnote

² At this point the crew thought that the stick shaker had activated again, but there was no evidence of this on the Flight Data Recorder.

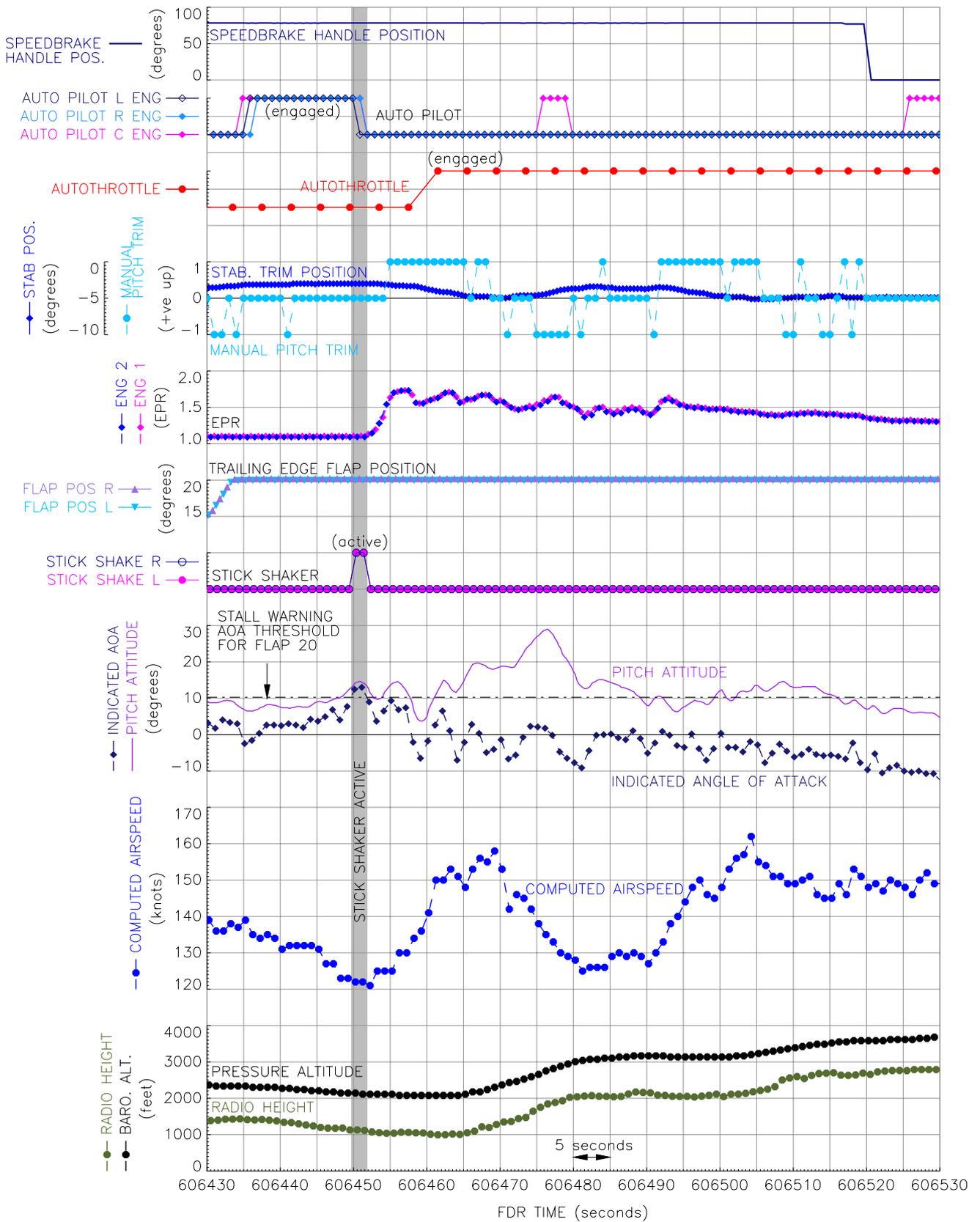


Figure 1
Salient FDR Parameters for the serious incident to G-MONK

Speedbrake warning

The Boeing 757 aircraft was originally fitted with a warning system that provided an EICAS message (“Speedbrakes EXT”) when the commander’s radio altitude indication was between 800 ft and 15 ft, and the speedbrake lever was beyond the ARMED detent. No warning of speedbrake extension, based on thrust lever position, was provided.

The Flight Crew Training Manual for the aircraft contains the advice:

‘the PF should keep his hand on the speedbrake lever whenever the speedbrakes are used in-flight. This will preclude leaving the speedbrake extended.’

In 1999, Boeing modified the speedbrake alert system for all B757s built after June 1999, to include a warning light whenever the speedbrake lever is beyond the ARMED detent and the engine thrust lever is forward of the flight idle position for more than 15 seconds. Boeing considered a retroactive change to the fleet, but this was not implemented.

As a part of this investigation, the AAIB conducted a survey of UK B757 operators that record, as part of their Flight Data Monitoring programmes, incidents where the speedbrakes are deployed whilst the engines are producing significant thrust. It is unlikely that the speedbrakes would be intentionally deployed with the engines set above flight idle; therefore, this would give an approximate indication of how often the speedbrakes are inadvertently left out on the B757. On approximately 1% of the sectors covered by the survey, at some stage during the flight, crews were using the speedbrake ‘against power’.

Stick shaker

The B757 Flight Crew Operations Manual, Non-Normal Manoeuvres section, requires certain actions to be accomplished immediately at the first indication of pre-stall buffet or stick shaker. These actions include for the PF to ‘Retract the speedbrakes’ and for the pilot monitoring (PM) to ‘verify all required actions have been completed and call out any omissions’

Flight Director Guidance

During a go-around with the localiser captured, the Flight Director roll bar will give directions to maintain the runway track. The pitch mode, after a positive rate of rotation and a positive vertical speed is achieved, should give guidance to maintain the selected MCP speed. The autothrottle will adjust the thrust levers to achieve a rate of climb of 2,000 fpm.

Boeing reviewed the FDR data and conducted various tests, but they were unable to explain why, during the go-around, the Flight Director Pitch Bars disappeared from both the commander’s and co-pilot’s PFDs

Simulator Assessment

The AAIB, with the assistance of an experienced B757 Type Rating Examiner (TRE), reviewed the approach and go-around in a simulator. The following was observed:

- The aircraft adopted a 15° nose-up pitch attitude in the climb during a normal ‘autopilot engaged’ go-around from just above stick-shaker speed. This increased to 20° with the speedbrakes extended.
- The autopilot applied approximately 11 units of nose-up trim during a go-around from a speed

just above stick-shaker operation. A significant forward force was required to maintain the desired pitch attitude when the go-around was flown with the autopilot disengaged. In this circumstance, when control was handed over from one pilot to another, there was a significant risk of the pitch attitude increasing.

- Flying a go-around with the speedbrakes extended felt abnormal to the TRE, as the power and attitude required were unusual.

Comment

This incident developed during a rushed approach, putting the crew under increasing pressure. However, having allowed the aircraft to slow to a speed where

stick shaker activation occurred on final approach, the situation was recovered by the commander making best use of the resources available to him by handing over control to the co-pilot, who retained his situational awareness throughout.

The crew considered that stick shaker activation had resulted from low airspeed on final approach. This was caused by a combination of the autothrottle being deactivated when the autopilot was disengaged and the speedbrakes being left extended. Disengaging the autothrottle had not been the commander's intention, but more a 'force of habit', as the autothrottle is normally disengaged together with the autopilot when landing. When he asked for the autopilot to be re-engaged, he was unaware of the status of the autothrottle.