INCIDENT

Aircraft Type and Registration:	Boeing 737-76N, G-STRH
No & Type of Engines:	2 CFM56-7B22 turbofan engines
Year of Manufacture:	2002
Date & Time (UTC):	7 March 2006 at 0945 hrs
Location:	Bristol International Airport
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 38
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	57 years
Commander's Flying Experience:	15,000 hours (of which 7,500 were on type) Last 90 days - 125 hours Last 28 days - 47 hours
Information Source:	AAIB Field Investigation

Synopsis

Whilst establishing on the ILS for Runway 09 at Bristol Airport, the flight crew conducted a visual orbit to lose height prior to intercepting the glidepath. During this orbit, which was flown without flight director assistance, the aircraft was subject to a strong southerly wind causing it to roll out with full localiser deflection, north of the ILS centreline. At this point the aircraft was approximately 600 ft below the glidepath and below the minimum radar vectoring altitude; the crew however, were visual with the ground in the vicinity of the airfield. At 3 nm from the runway threshold, having still not re-established on the ILS localiser, the Bristol Airport tower controller instructed the aircraft to go-around. A further radar vectored ILS approach was flown and the aircraft landed from this without incident.

History of the flight

The aircraft and crew were scheduled to fly from Manchester to Banjul, Gambia via a stop at Bristol Airport. They departed from Manchester Airport at 0920 hrs and after contacting Bristol Radar at 0941 hrs, were vectored onto the ILS localiser for Runway 09. The aircraft was initially cleared to descend to an altitude of 2,500 ft and intercepted the localiser at 8 nm from the airfield whilst descending through 3,500 ft (see Figure 1). After the flight crew called that they were established on the localiser, the radar controller transmitted 'DESCEND WITH THE ILS, CONTACT BRISTOL TOWER 133.85'. The crew checked in with the tower controller, who was a trainee under supervision, and were given clearance to land. However, the first officer who was the handling pilot and who was manually flying the aircraft using flight

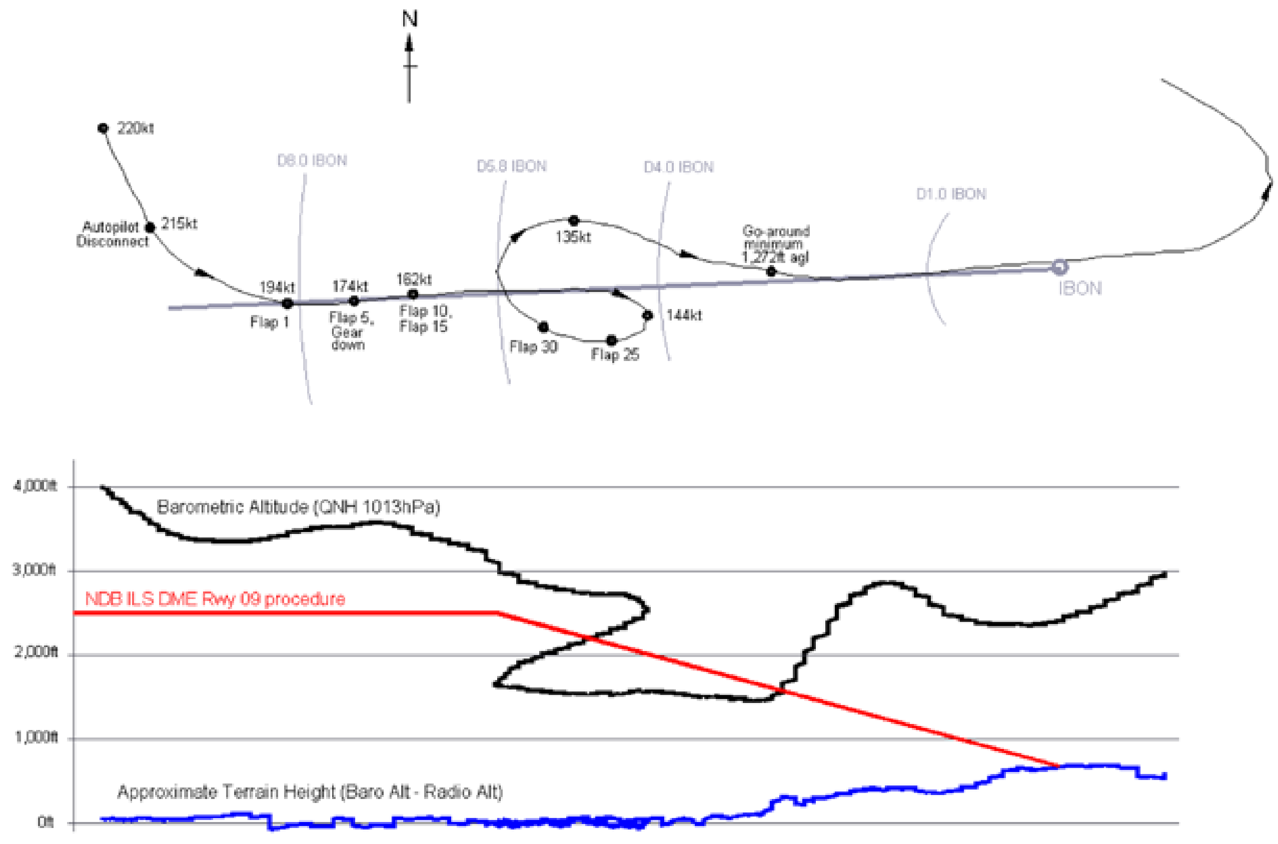

Figure 1

Aircraft positional data derived from its Quick Access Recorder

director commands, requested an orbit to lose height. At this time the aircraft was level at 2,800 ft, approximately 500 ft above the glidepath, and 5 nm from the runway threshold. The aircraft was cleared by ATC to fly the orbit and the aircraft commander declined the controller's offer of radar vectors to assist in re-establishing on the ILS. The first officer commenced a right descending turn and then switched off his flight director as it continued to give steering information towards the localiser. During the orbit, the aircraft was subjected to a strong southerly wind and the tower controller, using his radar monitor in the visual control room, could see the aircraft flying through the localiser to the north of the centreline. He transmitted 'YOU ARE GOING TO CLOSE THE FINAL APPROACH TRACK FROM THE NORTH PROBABLY AT LESS THAN A FOUR MILE FINAL, ARE YOU VISUAL WITH THE AIRFIELD?' The commander replied that they were not visual and the tower controller directed them to maintain 1,500 feet until established back on the ILS. At this point the aircraft was level at 1,500 ft; approximately 800 feet below the ILS glidepath (see Figure 1). The tower controller became concerned at the aircraft's slow progress in re-establishing onto the localiser and when the range to the runway threshold reached 3 nm, he instructed the aircraft to go-around. The flight crew realised that they were not going to intercept the localiser before capturing the glidepath and were on the point of initiating a go-around when they were instructed to do so by the tower controller.

The first officer flew the go-around manually until level at 3,000 feet and then engaged the flight director and autopilot. At this point the aircraft descended to 2,500 feet which was the previously cleared altitude still selected on the Mode Control Panel (MCP). The first officer selected 3,000 feet on the MCP and the aircraft climbed back to this altitude before a further radar vectored ILS approach was flown. The aircraft landed without incident.

Flight Recorders

The aircraft operator provided the AAIB with data which had been recorded by the Quick Access Recorder (QAR). The data covered the period from the initial approach to Bristol until the eventual landing and was used to derive Figure 1. Due to the late notification of the event the Cockpit Voice Recorder had continued to run and the pertinent recordings had been overwritten.

Meteorology

An aftercast from the Met Office revealed that the area was subject to a moistening south-westerly flow as a warm front moved across Cornwall and Devon from the west. At the time of the incident, Bristol Airport reported a surface wind of 130° at 16 kt, 8,000 metres visibility in light rain, cloud scattered at 700 ft and broken at 1,200 ft above the airfield. However Bristol Airport is situated at approximately 600 ft above sea level on the crest of a hill and as such can be subject to significantly different weather from that encountered on its approaches. The aftercast suggested that in the area where the aircraft executed its orbit, the visibility would have been 7-9 km in rain and there would have been some stratus cloud with a base of between 1,000 and 1,800 ft with further strato-cumulus cloud at a base of between 3,000 and 4,000 ft. The wind at 2,000 ft was estimated to be from 190º at 35-40 kt. The flight crew reported that they completed the original orbit in good VMC and although not always visual with the Airport, which is on the crest of a 622 foot hill and was at the time covered by a broken cloud layer, they were visual with the ground at all times.

Air Traffic Control

Bristol Manual of Air Traffic Services Part 2 Section 1 Chapter 5 states that:

> *'orbits by jet aircraft on final approach below altitude 2,500 feet either to be positioned in traffic or to lose height are not permitted. Aircraft already below this level should be instructed to climb on runway heading to altitude 3,000 feet. If the aircraft is with ADC (aerodrome controller), co-ordination with APC (approach controller) must be effected and, if necessary, aircraft should be transferred to APC for repositioning.'*

Discussion

The flight crew allowed the aircraft to descend significantly below the ILS glidepath, the minimum sector altitude and the minimum radar vectoring altitude with the airfield weather less than the company minima. This situation developed as a result of arriving at the final approach fix approximately 500 ft above the ILS glidepath. Anticipation of the likely approach path and awareness of the wind may have prevented this original situation from occurring but inevitably there will be occasions when aircraft have excess height to lose in order to intercept the glidepath. In these instances, repositioning the aircraft back onto the ILS at a more suitable height avoids the need for a high rate of descent to intercept the ILS glidepath.

Although the aircraft was in communication with Bristol Tower, control of the aircraft remained with Bristol Radar and it was necessary for the tower controller to liaise with the radar controller to approve any deviation from the original ILS clearance. Both tower and radar controllers approved the flight crew's request for an orbit but the requirement for the aircraft to maintain a minimum of 2,500 ft whilst orbiting was overlooked. This restriction, although designed to abate aircraft noise, would have kept the aircraft at the ILS platform altitude for re-establishing on the localiser. However, the tower controller, whilst monitoring the aircraft's height and position on the visual control room's radar, made a timely decision to limit the aircraft's descent to 1,500 feet until established back on the ILS.

The flight crew considered that an orbit was a pragmatic option to lose height given that they were in good VMC at that point and in visual contact with the ground. At no time were the speed, vertical rates, roll rates, terrain closure, terrain clearance or configuration changes outside the company limits. There was no concern over the lack of visual airfield references as they were intending to re-establish on the ILS for their final approach. The reported airfield weather was below circling minima which made it imperative that they re-established at the earliest opportunity. As they commenced their orbit, the decision by the first officer to deselect his flight director meant that he was flying on attitude only. He did this primarily because the flight director was giving steering information towards the localiser and it is the operating company's policy to switch the flight director off rather than fly contrary to its indications. However, deselecting the flight director also removed vertical steering information other than the ILS glidepath indication and therefore any positive guidance on a level off altitude. The MCP altitude window continued to display 2,500 feet whilst the aircraft descended to and maintained 1,500 feet. The strong crosswind also did not appear to have been considered as the orbit resulted in a roll out with full scale localiser deflection to the north of the centreline. This made re-establishing from the north (into the wind) more difficult and ultimately resulted in the go-around.

The operating company advocate the use of autopilot and autothrottle in normal operation. However the company Operations Manual also states:

> *'Continuous use of automatic systems leads to loss of basic knowledge of power settings/pitch attitudes and reduced ability to fly accurately with low workload. Pilots are therefore required regularly to fly the aircraft manually, with emphasis on manual approaches with and without the flight director. Good weather conditions and uncongested airspace should be chosen'.*

One of the reasons for using automation is the reduction in crew workload with commensurate increase in their situational awareness. Although the crew considered the orbit a relatively benign manoeuvre, full use of automation may have given them the extra capacity to compensate for the crosswind. Acceptance of radar vectors to reposition, although potentially adding a few extra track miles to that of an orbit, would almost certainly have prevented the go-around.

Follow up action

The operating company has reiterated to its flight crews the requirements that must be met when conducting a visual approach and has also issued Flight Crew Notice 51R/06 which states:

> *'If at any time, visual reference is lost, then an immediate go-around must be flown. Orbits on or during final approach in order to self position on the ILS are expressly prohibited'.*

Bristol Air Traffic Services commented that although orbits are permitted, they are not considered best practice for two reasons; controllers lose positive control of the flightpath of the aircraft (particularly pertinent when the aircraft is being sequenced with other aircraft) and noise is concentrated over a particular ground location.

On 28 March 2006, Bristol Air Traffic Services published a safety notice stating that in similar circumstances to this incident, *'ADC ATCO's* (aerodrome controllers) *should work closely with APR* (approach radar controllers*) to consider an appropriate course of action; best practice is normally to instruct the aircraft to maintain a terrain safe level, fly a suitable radar heading and transfer to APR for vectoring back into the pattern.'*