Turbulence injuries, Boeing 777-236, G-VIIO

Micro-summary: This Boeing 777-236 experienced turbulence in which a passenger experienced a broken ankle and several crewmembers were injured.

Event Date: 2004-08-16 at 2317 UTC

Investigative Body: Aircraft Accident Investigation Board (AAIB), United Kingdom

Investigative Body's Web Site: http://www.aaib.dft.gov/uk/

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2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***

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AAIB Bulletin No: 8/2005 **Ref: EW/G2004/08/08** **Category: 1.1**

Aircraft Type and Registration:	Boeing 777-236, G-VIIO
No & Type of Engines:	2 General Electric GE90-85B turbofan engines
Year of Manufacture:	1999
Date & Time (UTC):	16 August 2004 at 2317 hrs
Location:	Off the coast of the USA during climb
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 15 Passengers - 334
Injuries:	Crew - 5 (Minor) Passengers - 1 (Serious)
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	52 years
Commander's Flying Experience:	16,796 hours (of which 3,755 were on type) Last 90 days - 186 hours Last 28 days - 83 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

History of the flight

The aircraft was on a scheduled flight from Orlando Airport in the USA to London Gatwick Airport. Push back was at 2133 hrs with departure delayed until 2247 hrs due to ATC delays. The departure ATIS weather was reporting a surface wind of 140º/05 kt, visibility 7 km in light rain with cloud FEW at 1,500 feet and BKN CB (broken cumulonimbus) at 3,000 feet, OAT 24ºC and Dew Point 20ºC. The remnants of a hurricane were shown on the SIGMET (Significant Meteorological Information) chart centred some 350 nm north of Orlando.

The aircraft commander was the handling pilot for the flight and following departure, the aircraft was climbed towards the planned cruising level of FL370. The weather radar was set to 5º UP for departure and adjusted during the climb in order to scan the area ahead. No significant turbulence was encountered during the climb; the only weather returns were to the left of the aircraft's track and no closer than 50 nm. The area ahead of the aircraft shown on the weather radar displayed only green weather returns, the lowest level of precipitation returns depicted on the display, with the previously mentioned weather to the left painting either amber or red.

The aircraft was required by ATC to alter heading 10º to the right for other traffic and the commander checked the weather radar which continued to show green returns with the aircraft climbing in smooth air conditions. He discussed the requirement for the seat belt signs with the non-handling pilot and, given the length of time the passengers had been confined to their seats (almost 2 hours) and the smooth air conditions during the preceding 10 minutes, it was agreed they could be switched off. Shortly afterwards, with the aircraft climbing in IMC within cirrus cloud, the sky began to lighten. As the aircraft emerged from the cloud and as it was approaching FL320, it encountered severe turbulence. The indicated airspeed was seen to decay by approximately 20 kt, a momentary stick shaker activation occurred and the seat belt signs were selected ON. During the turbulence, a passenger suffered a broken ankle and five crew members received minor injuries.

Post turbulence encounter actions

The presence and position of the turbulence was reported to Jacksonville area control and was monitored by other aircraft in the area. The Cabin Service Director established the number and extent of the injuries and professional medical advice was sought on the treatment of the injured and whether the aircraft should divert. Following these discussions and consultation with the injured persons, it was agreed to continue to the planned destination of London Gatwick. The remainder of the flight was uneventful and the commander declared a medical emergency to Gatwick and was given an expeditious arrival routing.

Guidance to pilots on turbulence

The UK Civil Aviation Authority published an Aeronautical Information Circular (AIC) 81/2004 (Pink 66) entitled 'the effect of thunderstorms and associated turbulence on aircraft operations'. In the section dealing with the use of weather radar the document states:

> *'The significance of radar returns of given intensity usually increases with altitude, but the strength of the echo is not an indication of the strength of any turbulence'.*

Discussion

The crew had a difficult decision to make in balancing the risks of a potential turbulence encounter with the physiological needs of the passengers. Apart from the extensive presence of green radar returns indicating light to moderate precipitation, there was no associated weather indicated on the weather radar which might have warned the flight crew of the presence of the severe turbulence which, although short in duration, was severe. The person who suffered a broken ankle was standing with others waiting to use the toilet facilities. The maximum vertical accelerations were +2.367g and -0.352g. After the incident the commander was briefed by the operator not to switch off the seat belts sign whilst the aircraft was flying through green returns depicted on the weather radar.