

Airbus A320-214, G-OOAR, 2 March 2001

AAIB Bulletin No: 11/2002	Ref: EW/C2001/3/3	Category: 1.1
Aircraft Type and Registration:	Airbus A320-214, G-OOAR	
No & Type of Engines:	2 CFM56-5B4 turbofan engines	
Year of Manufacture:	2000	
Date & Time (UTC):	2 March 2001 at 0130 hrs	
Location:	18 nm south of Dublin Airport, Ireland	
Type of Flight:	Public Transport	
Persons on Board:	Crew - 7	Passengers - 187
Injuries:	Crew - 1 (serious)	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Airline Transport Pilots Licence	
Commander's Age:	56 years	
Commander's Flying Experience:	15,100 hours (of which 4,950 were on type)	
	Last 90 days - 114 hours	
	Last 28 days - 56 hours	
Information Source:	AAIB Field Investigation on behalf of Irish AAIU	

The aircraft was descending to the south of Dublin Airport, being positioned by means of radar vectors for an approach onto Runway 28, after a public transport charter flight from Lanzarote, Canary Islands. The first officer was the handling pilot. The aircraft configuration was clean, with Autopilot No 2 and Autothrust engaged.

The weather at the airport was calm, with a visibility greater than 10 km, with few clouds at 4,000 feet. The temperature was -5°C and the QNH was 1003 hPa. The crew described the visibility as being excellent, with the lights of Dublin city being clearly visible. However, as the aircraft was over the Wicklow mountains, there was some cloud close to the aircraft at 4,000 feet amsl.

The aircraft had been cleared by Dublin Air Traffic Control (ATC) to descend to 4,000 feet on the QNH (amsl), with no speed restrictions. As the aircraft descended through 4,200 feet, some 18 nm south of the airport, the Enhanced Ground Proximity Warning System (EGPWS) Mode 2 Alert activated. This produced a 'Terrain, Terrain - Whoop, Whoop - Pull Up, Pull Up' audio and visual warning. In view of the aircraft's proximity to the cloud, both flight deck crew members reacted to

the alert and carried out the standard EGPWS avoidance manoeuvre (full aft sidestick and Take-off/Go-Around TOGA thrust).

The aircraft pitched up smartly in response to these inputs. A cabin crew member who had been working in the aft galley area lost her balance and fell to the floor during the manoeuvre, sustaining a fractured collar bone. The senior cabin crew member advised that the injured crew member be kept in position on the floor for landing.

The flight deck crew carried out a gentle touchdown with minimal additional braking retardation. The airport authorities had been alerted to the situation and an ambulance met the aircraft shortly after arrival on stand to transfer the injured crew member to hospital.

Further similar occurrence

On 8 April 2001, another Airbus A320 aircraft, G-OOAD, of the same operator experienced a similar event in approximately the same location. Some 10 nm south west of Killiney, on a radar heading of 040°M, with an Indicated Air Speed (IAS) of 320 kt as requested by ATC, an EGPWS 'Terrain, Terrain' warning was generated for about two seconds, which then ceased, but then recurred after a further five seconds with a further 'Pull Up' warning. The commander reported that the warning ceased upon initiation of recovery action.

Unfortunately, the DFDR data from this event had been overwritten by the time notification had been received by the AAIB, so no more precise information was available.

Local topography

In the area where these events occurred, the terrain rises rapidly to elevations of 2,385 and 2,352 feet amsl, with higher peaks up to 2,686 and 2,788 feet amsl a few miles further west. The local sector safety altitude in this area is 4,100 feet. However, within 12 nm of the airport, there is no terrain elevation above 2,000 feet amsl.

ATC procedures

Separation from terrain is the responsibility of ATC only when a controller is giving radar vectors to a flight operating under Instrument Flight Rules, as in these cases. Descent clearances issued by ATC in these circumstances should always provide at least the minimum prescribed terrain separation, which is a minimum separation of 1,000 feet in this case.

For arrival and departure traffic at Dublin, there is a published speed restriction in place of a maximum of 250 kt IAS when flying below FL100. Airspeed restrictions (speed control), other than published speed restrictions/recommendations, are only applied by ATC for the purpose of providing separation with other aircraft or to facilitate sequencing. The controller has the discretion to remove a speed restriction when traffic conditions permit and thus pass responsibility for choice of operating speed to the aircraft commander. The controller may also, in certain circumstances, request that the aircraft maintain a specific higher speed for sequencing purposes.

EGPWS system operation

The relevant EGPWS Mode in these circumstances is Mode 2A, Excessive Terrain Closure Rate, with the aircraft not in the landing configuration and not on the glide slope beam. The activation

envelope for this mode is shown in Figure 1 (*jpg 172kb*). The warnings are triggered by high rates of descent measured by the Radio Altimeter, which is active below 2,450 feet above local ground level. The activation trigger is dependent upon the actual airspeed and rate of descent combination. In the case of G-OOAR, DFDR data indicated that the aircraft was descending some 19 nm south of the airport, in the vicinity of the 2,385 feet amsl terrain peak. Data showed that the aircraft was flying at an IAS of about 298 kt, passing through 4,200 feet amsl with an actual descent rate of about 1,500 feet per minute (by reference to barometric altimeter). However, due to the rapidly changing nature of the terrain being traversed at the time, the Radio Altimeter measured 2,200 feet above the local terrain, with a peak rate of closure of about 9,000 feet per minute. This rate was within the EGPWS Mode 2A activation envelope, so the aural alert and 'PULL UP' warnings were generated. At no time during the event did the aircraft actually descend to less than 1,700 feet above the local terrain, so the prescribed minimum terrain separation was not lost.

Spurious triggering of the EGPWS systems in aircraft should be avoided whenever possible, especially when flying above the Minimum Safe/Radar Vectoring Altitude in accordance with an ATC clearance.

The EGPWS contains an envelope modulation database, which offers the facility to decrease the sensitivity of the system at some airports where spurious warnings are encountered. However, not all aircraft in the operator's fleet are currently equipped with the Enhanced GPWS standard. Consequently, the operator considered that the requirement for crews to observe the standard speed restriction in the vicinity of this terrain was a preferred solution and has published this information in its Company Briefing Sheet for all flights which operate to Dublin.

However, this problem is not operator specific. Therefore there is a requirement for all pilots to be warned of the possibility of this type of spurious GPWS activation while operating in this area.

It is therefore recommended that:

Safety Recommendation 2002-34

The Irish Aviation Authority should place a warning in the Irish Aeronautical Information Publication (AIP), Dublin Approach Procedures, to highlight the probability of encountering a GPWS Terrain alert, for aircraft which are exceeding the standard speed restriction, while at or below 5,000 feet and which are in the vicinity of the high terrain to the south of Dublin Airport.

Safety Recommendation 2002-35

The Irish Aviation Authority should ensure that Dublin Air Traffic Approach Control procedures are arranged so as to avoid aircraft descending to the south of Dublin Airport at such combinations of airspeed and altitude where the GPWS Mode 2 may be subject to nuisance activation.

The Irish Aviation Authority has indicated that it will issue a Notice to Staff (Air Traffic Services Dublin), to advise controllers that they should not request aircraft to maintain an airspeed in excess of 250 kt while at or below Transition Level to the south of Dublin Airport, in the vicinity of the terrain which appears to be the problematic area regarding GPWS Mode 2 activation.