INCIDENT

Aircraft Type and Registration:	Boeing 737-800, EI-DHD
No & Type of Engines:	2 CFM 56-7B26 turbofan engines
Year of Manufacture:	2005
Date & Time (UTC):	23 December 2009 at 0847 hrs
Location:	Glasgow Prestwick Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 129
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	33 years
Commander's Flying Experience:	5,557 hours (of which 1,832 were on type) Last 90 days - 113 hours Last 28 days - 78 hours
Information Source:	Airfield operator's investigation report and further enquiries by the AAIB

Synopsis

The aircraft made a normal landing on Runway 31 at Prestwick Airport. As the turnoff at the end of the runway approached, the brakes were applied, with no apparent effect, and the aircraft slid off the end of the runway onto the grass. There was no reported damage to the aircraft and there were no injuries to its occupants. The surface at the stop end of the runway was icy.

History of the flight

The United Kingdom had been experiencing snow and ice with sustained sub-zero temperatures for several days preceding the accident.

The aircraft was operating a scheduled service from Dublin, Ireland to Glasgow Prestwick Airport, UK. The commander was the handling pilot for the sector. Weather conditions at Prestwick were clear, with good visibility and no precipitation. A SNOWTAM issued at 0820 hrs described Runway 13 as having frozen ruts or ridges with a mean depth of 6mm in each third. Estimated braking action was listed as medium/good for all three thirds of the runway.

En-route the co-pilot listened to the ATIS information B, issued at 0824 hrs, which broadcast as follows:

"RUNWAY 13, SURFACE WIND CALM, VISIBILITY 10 KM, FEW AT 3,000, TEMPERATURE -2°C, DEW

POINT -4°C, QNH 985 MB QFE 984 MB. RUNWAY WET, BRAKING ACTION MEDIUM GOOD DECIMAL THREE SEVEN, WET BRAKING ACTION MEDIUM GOOD DECIMAL THREE SIX, WET BRAKING ACTION MEDIUM GOOD DECIMAL THREE SIX. TAXIWAY ROMEO IS CLOSED EASTERLY FROM BRAVO TO WESTERLY HOLDING POINT QUEBEC DUE ICE. TAXIWAYS AND APRONS ARE EXTREMELY ICY, PLEASE USE CAUTION."

He informed the commander of the surface wind and the reported braking action; he added "AND IT'S ICY OBVIOUSLY". There was no further discussion between the crew about the surface conditions.

At 0835 hrs, the crew made contact with Prestwick Radar. They were advised that ATIS information B was current and that they were number two behind a company aircraft positioning to land on Runway 31. ATC asked which runway they would prefer and the crew opted for Runway 31. ATC also advised that Taxiway K was closed and that the aircraft would have to vacate the runway at J. A copy of the aerodrome chart is included at Figure 1.

The preceding company aircraft landed on Runway 31 at 0844 hrs and vacated successfully at the end onto Taxiway J.

At a distance of 4 nm on final approach, the crew noticed a temporary deviation in the localiser signal and had a brief discussion about the reason for it. The approach was continued and at 0846:50 hrs a normal touchdown was made on Runway 31. A closed circuit television camera recording showed that the aircraft touched down on Runway 31 in the touchdown area. ATC instructed the aircraft to vacate at J and proceed to Stand 3. The co-pilot replied and at the same time notified ATC that they had experienced a disturbance in the localiser signal at 4 nm.

The commander recalled cancelling the autobrake at about 100 kt and selecting reverse thrust at 60 kt, before allowing the aircraft to roll to the end of the runway prior to vacating. This was confirmed by the recorded data. Approaching the runway end, the brakes were re-applied but there was no apparent reduction in speed. Realising that the brakes were not decelerating the aircraft sufficiently, the commander increased the pressure to maximum and advised the co-pilot of the problem.

Braking was still ineffective, so, with the end of the runway approaching, the commander attempted to turn the aircraft 90° to the left, onto the taxiway, to avoid a runway excursion. The nose of the aircraft slewed 45° to the left but the wheels continued to track along the runway and the aircraft slid off the paved surface onto the grass at a groundspeed of 24 kt.

Recorded data indicated that the second application of braking started at 0847:24 hrs, at a groundspeed of 42 kt, using gentle pressure at first, increasing to the maximum. The aircraft left the paved surface thirty seconds later at 0847:54 hrs and travelled a further 20 m, before coming to a stop with the wheels having sunk into the grass.

The passengers and crew vacated the aircraft via the forward airstairs onto the grass and moved across to the surface of the taxiway and runway. Several people commented afterwards that the paved area was very slippery to stand on. Photographs of the runway and taxiway, which were taken at the time, appeared to show a glazed reflective surface, suggesting the presence of ice. There was no evidence of any technical problem with the braking systems of the aircraft.

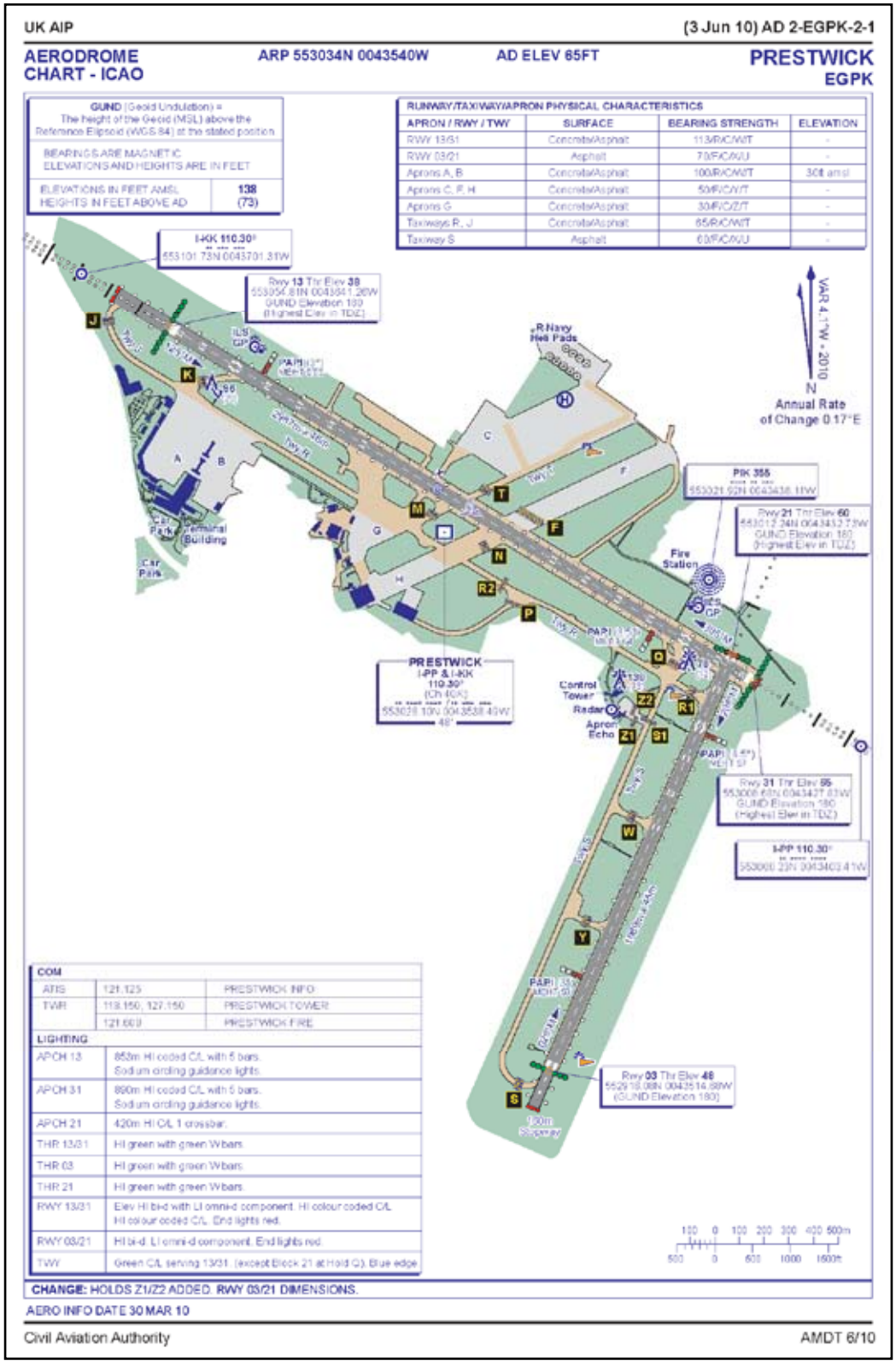

Figure 1

Airport information

Runway 31 at Prestwick has a LDA of 2,987 m and a width of 46 m. At 0430 hrs, Prestwick Airport Winter Operations team carried out a de-icing run on Runway 13/31 and links J, K and Q. The run encompassed an area 15 m either side of the centreline over the full length of main runway and 7.5 m either side of the taxiway centreline on the links. The de-icing rig was automatically limited to an application rate of 20 gram per square metre (g/m2), the rate appropriate for anti-icing. For de-icing, a rate of 30-70 g/m2, dependant upon temperature, is required.

At 0620 hrs ATC issued the following SNOWTAM:

> *'Runway 13 with frozen ruts or ridges with mean depth 6 mm each third. Additional comments – Runway 21/03 closed and taxiways & aprons useable with caution.'*

At 0747 hrs a Boeing 737 aircraft landed on Runway 13. Whilst back tracking, the pilot commented to ATC that there was no adverse effect on landing or braking. At 0758 hrs, a Mu-meter friction test was carried out on Runway 13 by Airfield Operations. The dual average readings taken were 0.37, 0.36 and 0.36. The runway condition at the time was wet full length, with ice patches full length and frozen slush along the full runway. At 0800 hrs, Airfield Operations personnel discussed the surface conditions on the airfield and an agreement was reached that at that time no further de-icing fluid was required.

After the incident the runway was temporarily closed. Re-declared distances were calculated for departures from Runway 13 and arrivals on Runway 31. At 1109 hrs, Mu meter readings of 0.42, 0.42 and 0.38 were obtained and the runway was re-opened.

Recorded information

The two flight recorders were recovered from the aircraft and replayed at the AAIB. Both contained a complete recording of the incident and the preceding events.

Following the incident, the crew pulled the circuit breakers to preserve the Flight Data Recorder (FDR) and the Cockpit Voice Recorder (CVR). This was in accordance with the data retention policy contained in the approved company Operations Manual.

EU OPS. 1.160 *'Preservation, Production and use of Flight Recorder Recordings'* requires that:

> *'(a) Preservation of recordings:*
>
> *1. Following an accident, the operator of an aeroplane on which a flight recorder is carried shall, to the extent possible, preserve the original recorded data pertaining to that accident, as retained by the recorder for a period of 60 days unless otherwise directed by the investigating authority.'*

In previous AAIB investigations, where CVRs have not been turned off and vital information has been lost as a consequence, the AAIB has made a number of Safety Recommendations[1] to both operators and regulators to review procedures and training with a view to enhancing the probability that vital recorded information is not lost following an incident or accident. The crew involved in this incident, acting in accordance with their operating procedures, ensured that FDR and CVR information would be available to the investigation.

Footnote

[1] Safety Recommendations 2010-012, 2010-011, 2008-064, 2006-063, 2006-062, 2005-054, 2005-053, 2005-052.

Discussion

The flight crew were both familiar with Prestwick Airport. After landing, they would normally have expected to vacate the runaway via the rapid exit onto Taxiway K. On this occasion, ATC advised the crew prior to landing that K was not available and that they would have to vacate at the end of the runway.

The co-pilot listened to the ATIS but did not pass on the exact detail of the 'EXTREMELY ICY' taxiways and apron. Perhaps because of this, there was no apparent discussion between the crew about the surface conditions and the potential problems with operating on a slippery surface.

A de-icing run was carried out on the runway but at an application rate only suitable for anti-icing. Therefore, it is likely to have been of limited effectiveness.

It was not possible to tell from the recorded data whether the aircraft maintained the centreline of the runway throughout the landing roll but it seems unlikely that it was outside the 30 m treated strip. The loss of braking effectiveness appears to have started at the onset of the second application of the brakes and, despite the commander having applied up to maximum brake pressure, continued until the aircraft left the paved surface. There was, therefore, a period of 30 seconds where the brakes were applied but were not appreciably slowing the aircraft. This suggests that the runway surface was slippery between K and J, at least in some areas, as the result of ice. There was no attempt to re-deploy reverse thrust, probably because it is an unusual action once cancelled. It could, however, have had some beneficial effect, although it does take a few seconds for engines at idle power to spool up.

The crew of the preceding aircraft did not report any difficulty with the braking action on the same runway four minutes earlier. Why there was a difference was not established.

The deviation in the localiser signal observed by the crew was co-incident with the preceding aircraft vacating the runway and probably occurred as a result.

Safety action

The airport operator identified a number of areas in their winter operations where their procedures could be improved and made appropriate safety recommendations, with a particular focus on anti-icing and de-icing operations. The airline operator has included a training module on operations to or from slippery runways in its recurrent training programme. Therefore, it is not considered necessary to make any further Safety Recommendations.