BN2B-26 Islander, G-BLDV

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INCIDENT

Aircraft Type and Registration:	BN2B-26 Islander, G-BLDV
No & Type of Engines:	2 Lycoming O-540-E4C5 piston engines
Year of Manufacture:	1984
Date & Time (UTC):	8 March 2000 at 1015 hrs
Location:	66 nm on 165° radial from Stornaway VOR
Type of Flight:	Public Transport
Persons on Board:	Crew 1 - Passengers - 2
Injuries:	Crew None - Passengers - None
Nature of Damage:	None
Commander's Licence:	ATPL
Commander's Age:	45 years
Commander's Flying Experience:	7,241 hours (of which 485 were on type) Last 90 days - 48 hours Last 28 days - 13 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and other enquiries made by the AAIB

History of the flight

The air ambulance flight was routing fromGlasgow to Stornaway using the airway designated A1 D. Since moderate icing conditions wereforecast, the pilot checked for correct operation of the pneumatic de-icing bootswhilst conducting the pre-take off checks. The aircraft was equipped with an autopilot but did not have a weatherradar. The actual take off-weight ofthe aircraft was 2,681 kg and it was serviceable. The maximum authorised take-off weight is 2,995 kg

Theaircraft was cleared for departure from Runway 23 at Glasgow at 0850 hrs. At0856 hrs, whilst climbing through 4,000 feet, the flight was handed over to theScottish Area Control Centre (ScACC) at Prestwick who cleared the aircraft toFL 85 under a Radar Advisory Service. As the aircraft approached FL 85 the commander requested FL 95 but hewas advised that this was an incorrect quadrantal level and was offered aclearance to FL 105, which he accepted. At 0911 hrs the commander reported that he was unable to reach FL 105,possibly because of mountain wave activity, and he requested a descent back toFL 85. At 0935 hrs he requested anoperating band from FL 65 to FL 85 because of more pronounced mountain waveactivity. He was now in icing conditionsand utilised both the propeller and airframe de-icing systems, which operatedsatisfactorily.

At1012 hrs the aircraft was IMC at FL 65 with an indicated airspeed of 110 ktwhen the pilot noticed a sudden build up of ice on the wheels, struts and tyres. He was unable to maintain altitude andrequested radar vectors to a clear area. The ScACC controller suggested that he turn west, towards thecoast, which was an estimated 8 miles away. The pilot then declared an emergency and was asked to set the emergencytransponder code of 7700. The pilot allowed the speed to reduce to70 kt and then entered a descent at that speed; the engines remained at fullpower. Approximately 3 nm prior to reaching the coast at an altitude of4,200 feet the aircraft entered clear air and the ice melted rapidly. The pilot then chose to continue towardsStornaway since the route appeared to be clear of cloud. He climbed to FL 75 and the remainder of theflight was uneventful. The aircraftlanded at 1126 hrs.

Aircraftde-icing systems

Theaircraft was cleared for flight into known or forecast icing conditions notmore severe than light. It wasequipped with the following de-icing systems, all of which were serviceable:

a. Pitothead and stall warning vane heaters

b. Anaircraft heater and windscreen demisting system

c. Electricalpropeller de-icing system

d. Airframede-icing system

e. Electricallyheated glass panel in pilots windscreen

Thepilot also carried an electric torch of sufficient power and capacity toilluminate the wing leading edges from the flight compartment. The airframe de-icing system is a pneumaticsystem that operates inflatable boots installed on the leading edges of thewings and the tail unit. Selection andoperation of the pneumatic system is controlled electrically. The system can be operated in manual mode orin automatic mode in which case a timing unit ensures alternate inflation anddeflation of the boots to a predetermined cycle. As soon as the airframe de-icing system has cleared the iceaccretion the system should be switched OFFuntil a further build up occurs. Ifthis is not done there is a danger that ice will form over the profile of theinflated boots making the system ineffective. The system should therefore not be run continuously but should beused intermittently.

Meteorology

Thesynoptic situation at 0900 hr on 8 March 2000 indicated a complex low pressurearea just to the north of the Shetland Islands with a slow moving warm frontlying from Cambletown to York. A strongunstable

westerly airstream covered the area. The meteorological forecast, available to the pilot prior to take off,indicated the following conditions for the area to the north of Glasgow:

Generally: 8 km visibility in rain anddrizzle,

5-8octas Stratus and Stratocumulus, base 1,000 feet, tops 5,000 feet

7-8octas Altocumulus and Altostratus, base 7,000 feet, tops 17,000 feet

Isolated: 15 km visibility in nilweather,

5-8octas Stratocumulus, base 2,500 feet, tops 7,000 feet

3-6octas Altocumulus, base 7,000 feet, tops 10,000 feet

Occasionally: 4,000 metres visibility in heavyrain

6-8octas Status and Stratocumulus base 500 feet, tops 7,000 feet

8octas Nimbostratus, base 7,000 feet, tops 20,000 feet

Occasionally: 1,500 metres visibility in rain,drizzle and mist

8octas Status and Stratocumulus base 400 feet, tops 5,000 feet

8octas Layered from 7,000 feet, to 17,000 feet

There were associated warnings of moderateicing and moderate turbulence in cloud with isolated severe turbulence below7,000 feet and severe icing in nimbostratus clouds. There was also a warning of mountain waves with a maximumvertical speed of 550 fpm near 9,000 feet. The destination weather was forecast to be good with a strong westerlywind, visibility greater than 10 km, and a few clouds at 1,500 feet.

Anaftercast, obtained from the Meteorological Office, confirmed the validity ofthe forecast conditions. Local wind andtemperature profiles derived from the aftercast, are depicted below:

Height (feet amsl)	Wind (kt)	Temperature (°C)
3,000	270°/55	+02
4,000	270°/60	+0
5,000	270°/60	–01
6,000	270°/60	+01

8,000	280°/65	+0

Thiswind profile is indicative of Standing Waves. The uplifted air associated with these waves can produce an upward motionto the clouds which further increases the water density and hence the risk oficing. Clearly the upward motion of airis strongest in convective clouds such as cumulus and cumulonimbus butorographic motions can also produce severe ice accretion at times.

Operating instructions

Theoperator had recently issued a Notice to Aircrew providing guidance for pilotswhen flying in forecast icing conditions. The Notice states:

> If you suspect that significant airframeicing is likely:
>
> - Do not plan to route over the highestground, Go round it

The selected airway, AI D, passes over the GrampianMountains and close to Ben Nevis (4,410 feet) whereas an alternative route wasavailable via airway N 573 D to Tiree. This alternative route, along the western coast of Scotland, passes overlower terrain and would have been less affected by standing wave activity andthe attendant increase in severity of icing.