

S1/2001 - SD3-60 Variant 100, G-BMNT

AAIB Bulletin No: S1/2001 **Ref:** EW/C2000/2/6 **Category:** 1.1

Aircraft Type and Registration: SD3-60 Variant 100, G-BNMT

No & Type of Engines: 2 PT6A-67R turboprop engines

Year of Manufacture: 1987

Date & Time (UTC): 27 February 2001 at 1731 hours

Location: Birnie Rocks, nr Granton, Firth of Forth, Scotland

Type of Flight: Public Transport

Persons on Board: Crew - 2 - Passengers - None

Injuries: Crew - 2 Fatal - Passengers - N/A

Nature of Damage: Aircraft destroyed

Commander's Licence: Airline Transport Pilot's Licence

Commander's Age: 58 years

Information Source: AAIB Field Investigation

Summary

The aircraft was carrying out a scheduled mail flight with a crew of two aboard. The Shorts SD 3-60, a twin engine type, suffered a double engine failure shortly after take-off from Edinburgh Airport. The flight crew ditched the aircraft in the Firth of Forth in shallow water close in to the shoreline. The aircraft was severely damaged in the surface impact and the forward section became submerged.

The accident will be the subject of an Inspectors Investigation. One safety recommendation has been made so far as a result of the investigation.

History of flight

The aircraft landed at Edinburgh Airport, Scotland, at 0003 hrs on 27th February 2001. The weather conditions were as follows:- Surface wind 040°/22 gusting 36 kt, visibility 5,000 metres, light ice pellets, scattered cloud at 900 feet, broken cloud at 1,200 feet, temperature +1°C/dewpoint 0°C and QNH 992 mb. The aircraft was taxied to and parked on Stand 31, on a heading of 034°M. The aircraft remained on the stand until 1716 hrs.

The overnight weather conditions comprised a continued strong north easterly wind, maximum recorded speed of 43 kt, with light or moderate snow falling until 0952 hrs. There was no further snow after this time and by 1500 hrs the weather conditions were wind 030°/16 kt, good visibility, cloud scattered at 4,000 feet, broken at 7,000 feet and temperature +2°C/dewpoint -3°C. Weather conditions remained similar until after the time of the accident. Sunset was at 1745 hrs.

At 1503 hrs the aircraft was given start clearance. At 1512 hrs the crew advised ATC they were shutting down due to a technical problem. The crew then advised their company that a generator would not come on line.

An avionics technician carried out diagnosis during which both engines were ground-run twice. Each run was carried out by the flight crew and involved between 10 and 15 minutes running at low power. No fault was found. The engines were then re-started, although the aircraft remained on stand for approximately another 20 minutes.

At 1710 hrs the aircraft requested taxi clearance. The aircraft powered back off stand and taxied to depart from Runway 06. During the taxi out, as part of the engine checks, the crew carried out an autofeather test during which the automatic operation of the engine anti-icing vanes was also observed.

The weather conditions remained clear. A normal take off was carried out followed by a reduction to climb power at 1,200 feet amsl. At 2,200 feet amsl the aircraft anti-icing systems were selected on. Three seconds later the torque on each engine reduced rapidly to zero. A MAYDAY call was made by the crew advising that they had experienced a double engine failure. A further call was made advising ATC that the aircraft was ditching. The aircraft ditched in the Firth of Forth close in to the shore. Witnesses reported the sea to have been rough, with the waves breaking over the sea wall.

Discussion

The interval between the failure of the first and the second engine was very short (approximately 0.37 seconds) and therefore likely to have been as a result of a common event.

Each engine installation on the SD3-60 is equipped with an intake system consisting of a forward facing lip below the propeller leading into horizontal trunking below the engine, which in turn supplies a plenum chamber at the back of the engine. The engine type has a reverse flow layout, air entering via a cylindrical mesh screen situated within the plenum chamber. The air intake lip-skin de-icing systems utilise electrical heating and inertial separators are fitted at the rear of the trunking. The latter systems consist of two mechanically linked vanes in each intake. When selected ON, a forward hinged flap on the upper surface within the intake trunking moves downward reducing the cross-section of the intake flow path and deflecting the airflow through a more acute angle as it enters the plenum chamber. Solids or liquids in the intake flow thus centrifuge to the outer circumference of the flow path and exit to the atmosphere via the bypass door (ie, the second vane) thus preventing clogging of the compressor inlet screen. The inertial separator systems are controlled by two adjacent switches on the flight deck, one for each engine. These switches were identified as having been activated approximately 3 seconds before the double engine failure.

Although the investigation is still at a very early stage, the possibility is being considered that a change of intake conditions, caused by the activation of the anti-ice vanes in flight, might have resulted in the simultaneous failure of both engines. Engine blanks had not been fitted during the period when the aircraft was parked at Edinburgh. It is therefore probable that there was an accumulation of snow in the engine air intake systems, either in the trunking, the plenum chambers or both. It is also possible this did not clear during the interval of clear weather or during the low power engine runs. Icing conditions were not present during flight and the airframe was reported to be clear of ice prior to departure.

The mechanism by which operation of the inertia separator vanes may have interacted with residual ice, snow or slush to cause engine power loss is not understood at present. Further tests and research are being conducted.

The following safety recommendation was made on 6th March 2001

Recommendation 2001-39

It is recommended that:-

The CAA requires the manufacturer to advise all operators of the possibility of snow accumulation in the engine air intakes when parked, subsequently resulting in engine failures. Further to advise that such a failure may be precipitated by a change of intake conditions resulting from the activation of the anti-ice vanes.