

AIRCRAFT ACCIDENT REPORT NO 1/2006

This report was published on 11 January 2006 and is available on the AAIB Website www.aaib.gov.uk

REPORT ON THE ACCIDENT TO FAIREY BRITTEN NORMAN BN2A Mk III-2 TRISLANDER, G-BEVT at GUERNSEY AIRPORT, CHANNEL ISLANDS on 23 JULY 2004

Registered Owner and Operator:	Aurigny Air Services
Aircraft Type:	Fairey Britten Norman BN2A Mk III-2 'Trislander'
Nationality:	British
Registration:	G-BEVT
Place of Accident:	Guernsey Airport
Date and Time:	23 July 2004 at 0637 hrs All times in this report are UTC

Synopsis

Shortly after takeoff from Guernsey Airport, a loud crack or bang was heard in the aircraft's cabin. The aircraft commander was told by a colleague in the cabin that one or more passengers had been injured and that a cabin window was broken. He decided to return to Guernsey Airport having been airborne for approximately four minutes. After the passengers disembarked the pilot noticed that a de-icer boot had separated from the left hand propeller and was now on the seat inside the cabin, adjacent to the broken window.

The investigation identified the following causal factors:

- (i) The accident was caused by the separation of a de-icer boot from the left propeller during takeoff.
- (ii) The de-icer boot separated due to peel stresses generated by forces on the propeller. The

peel stresses arose because of physical or contamination damage to the adhesive bond which occurred because the required filler material was not used at the root of the de-icer boot.

Two Safety Recommendations were made during the course of the investigation.

Findings

- 1 During takeoff, while the engines were at high power, a de-icer boot from a blade of the left hand propeller separated and struck an adjacent cabin window, penetrating the window and injuring two passengers.
- 2 The left hand propeller was fitted with a BF Goodrich de-icing system including the de-icer boots on the propellers, in accordance with BF Goodrich technical report No 59-728.

- 3 The aircraft was type certificated in accordance with British Civil Airworthiness Requirements (BCAR) Section 'K'. This airworthiness code contained no requirement to protect passengers from piston engine or propeller parts.
- 4 Installation of the de-icer boots was certified on the appropriate JAA Form One as having been completed in accordance with the appropriate Hartzell Manual 133C. However, the filler material required by that Manual had not been applied.
- 5 Work was carried out on the propeller to replace a defective harness guard and restrainer strap. It is possible that some damage had occurred to the adhesive bond of the de-icer boot at this time but because the blade number was not recorded, it was not possible to confirm that this was the blade which subsequently shed the de-icer boot.
- 6 The laboratory report concluded that there was probably a small region of the lead strap of the de-icer boot, outboard of the restrainer strap, which was unbonded.
- 7 The small unbonded area of the lead strap created a natural chamber for moisture and other contaminants to enter and be trapped, further degrading the adhesive bond.
- 8 Growth of the disbonded area caused increasing peel stresses which led to final failure of the remainder of the adhesive bond, and separation of the de-icer boot.
- 9 There was a period when the filler material and suitable alternatives were commercially unavailable in the UK. These materials became available again in mid 2003. However the short shelf life of the materials may have created difficulties in the meantime for maintenance and repair organisations outside the USA.
- 10 The UK CAA identified approximately 100 propellers which had been overhauled without using the required filler.
- 11 The manufacturer and the UK CAA have proposed a rectification process for affected propellers.
- 12 Industry wide, the incidence of de-icer boots becoming completely detached is low, even though disbonding is sometimes detected during inspections.
- 13 Efforts to control human factors in maintenance need to be continued and enhanced within a pan-European context.
- 14 There is potential in the use of a thermal imaging to identify hot spots in poorly bonded regions of electrical de-icer boots.

Safety Recommendations

The following safety recommendations have been made:

Safety Recommendation 2005-078

The UK Civil Aviation Authority and the European Aviation Safety Agency should work closely together to develop further the valuable progress already made in human factors in aircraft maintenance, focusing on the underlying reasons for both errors and violations, with a view to reducing the potential for system-induced errors and violations, and therefore the risk of maintenance related accidents.

Safety Recommendation 2005-079

Hartzell Propeller Incorporated should investigate the feasibility and potential benefits of using thermal imaging techniques to inspect de-icer boots for disbonded areas.