No: 7/90 **Ref: EW/C1165** **Category: 1a**

Aircraft Type and Registration:	BAC One-Eleven 528FL, G-BJRT
No & Type of Engines:	2 Rolls Royce Spey 512-14DW turbofan engines
Year of Manufacture:	1971
Date and Time (UTC):	10 June 1990 at 0740 hrs
Location:	Over Didcot, Oxfordshire
Type of Flight:	Public Transport
Persons on Board:	Crew - 6 Passengers - 81
Injuries:	Crew - 1(Serious) 1(Minor) Passengers - None
Nature of Damage:	Left windscreen blown out, HF aerial removed Score marks on upper fuselage
Crew Licences:	(a) *Commander:* Airline Transport Pilot's Licence (b) *Co-pilot:* Airline Transport Pilot's Licence
Commander's Age:	(a) *Commander:* 42 years (b) *Co-pilot:* 39 years
Crew Total Flying Experience:	(a) 11,000 hours (of which approximately 1,000 were on type) (b) 7,500 hours (of which approximately 1,000 were on type)
Information Source:	AAIB Field Investigation

History of the flight

The accident occured during a scheduled flight from Birmingham to Malaga, Spain. The aircraft took off from Birmingham International Airport at 0720 hrs UTC and was initially cleared to FL 140. Having been transferred by ATC to the Bristol sector controller of London Air Traffic Control Centre, the crew were instructed to maintain a radar heading of 195° and cleared for a further climb to FL 230. The co-pilot had been the handling pilot during the take-off and, once established in the climb, the commander was handling the aircraft in accordance with the operator's normal operating procedures.

At 0733 hrs as the cabin staff prepared to serve a meal and drinks, and as the aircraft was climbing through about 17,300 feet pressure altitude, there was a loud bang and the fuselage filled with condensation mist. It was at once apparent to the cabin crew that an explosive decompression had occurred. The commander had been partially sucked out of the aircraft through his windscreen

aperture. The flight deck door had been blown onto the flight deck and lay across the radio and navigation console. The No 3 steward, who had been working on the cabin side of the door, rushed onto the flight deck and held onto the commander round his waist. The purser removed the debris of the door and stowed it in the forward toilet. The other two cabin staff instructed the passengers to fasten their seat belts.

The co-pilot had immediately taken control of the aircraft and initiated a rapid descent to FL 110. He made a distress call on the frequency in use but was unable to hear its acknowledgment due to the noise of rushing air on the flight deck. The purser entered the flight deck and, having hooked his arm through the seat belts of the fourth crew member jump seat, was able to assist in the restraint of the commander. The two men tried to pull the commander back within the aircraft and, although they could see his head and torso through the left direct vision window, the effect of the slipstream frustrated their efforts. The No 2 steward entered the flight deck and strapped himself into the left jump seat whereafter he was able to relieve the original steward who was beginning to lose the strength in his arms as they suffered from frostbite and bruising from the windscreen frame. The No 2 steward grasped the commander's legs and held him thus until after the aircraft had landed.

Meanwhile, the aircraft had descended to FL 100 and slowed to about 150 kt. The co-pilot had requested radar vectors to the nearest airport and had been turned towards Southampton airport to which approach frequency he was eventually transferred. Having verified that there was sufficient runway length available for a landing, the co-pilot manoeuvred the aircraft onto a visual final for runway 02 and completed a successful landing and stop on the runway at 0755 hrs. As soon as the aircraft came to a halt passengers were disembarked from the front and rear airstairs while the airport and local fire services recovered the commander from his position half out of the windscreen frame where he had remained throughout the descent and landing. He was taken to Southampton General Hospital suffering from bone fractures in his right arm and wrist, a broken left thumb, bruising, frostbite and shock. The other crew members and passengers were medically examined but apart from one steward who had cuts and bruising to his arm there were no other injuries.

Engineering investigation

The windscreen was found near Cholsey, Oxfordshire, along with a windscreen corner fairing strip and some associated bolts. Of the 90 bolts used to attach the windscreen to the aircraft, 11 had remained in the windscreen, 18 were found loose nearby, and one had remained in the aircraft window frame.

The Illustrated Parts Catalogue specifies that the attaching bolts should be part number A211-8D. Twenty six of the bolts recovered with the windscreen were new bolts part number A211-8C. The remaining four bolts recovered were re-used bolts part number A211-7D. The specifications for these bolts are:

Part No.	Shank length (inches)	Diameter (inches)
A211-8D	0.8	0.1865-0.1895
A211-8C	0.8	0.1605-0.1639
A211-7D	0.7	0.1865-0.1895

The left windscreen had been changed during the nightshift of the 8/9th June 1990 and the accident flight was the first since that installation. Eighty of the bolts which had attached the old windscreen were recovered from the work area during the investigation, and 78 of these were identified as A211-7D, the remaining two being A211-8D. The old windscreen had therefore been primarily attached by bolts which were 0.1 of an inch shorter than those specified.

The replacement windscreen had been installed with 84 bolts whose diameters were approximately 0.026 of an inch below specification, and 6 bolts which were of the correct diameter, but 0.1 of an inch too short.

The bolts are fitted into 'Kaylock' floating anchor nuts which are attached to the airframe; the self locking action is the result of part of the nut being an elliptical shape prior to the insertion of the bolt. The shape of the nut allowed sufficient grip for the reduced diameter bolts to be torque loaded to the required value, but insufficient grip to retain the bolts against the forces produced by cabin pressurisation during flight at altitude.

The Chief Inspector of Air Accidents has ordered a Formal Investigation into this accident.