SERIOUS INCIDENT

Aircraft Type and Registration:	DHC-8-402 Dash 8, G-JECN
No & Type of Engines:	2 Pratt & Whitney Canada PW150A turboprop engines
Year of Manufacture:	2005
Date & Time (UTC):	5 January 2010 at 0710 hrs
Location:	Near Southampton
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 4 Passengers - 23
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	6,000 hours (of which 2,000 were on type) Last 90 days - 100 hours Last 28 days - 27 hours
Information Source:	Aircraft Accident Report Form submitted by the commander and further enquiries by the AAIB

Synopsis

G-JECN departed from Southampton Airport without difficulty. However, during the climb to FL240 the co-pilot noticed an excessive climb rate on the pressurisation system which was shortly followed by the pressurisation fault annunciator. The flight crew attempted to correct the fault but were unsuccessful and so went on to oxygen. They declared a MAYDAY and completed an emergency descent. The MAYDAY was subsequently downgraded to a PAN and the aircraft safely returned to Southampton Airport. Cabin crew and passengers were checked and found to be fit and well. Post-incident investigation indicated that a faulty aft pressure outflow valve was the probable cause of the pressurisation failure.

History of the flight

The aircraft was on a flight from Southampton Airport, UK, to Dublin Airport, Ireland. The aircraft performed an uneventful takeoff and was cleared to climb to FL240 en route.

Flight crew recollections

On passing FL230, the PNF (pilot not flying) observed an excessive climb rate on the pressurisation system, which was shortly followed by the pressurisation fault annunciator. In an attempt to rectify the fault, the PF (pilot flying) selected pressurisation to MAN and then back to AUTO, but the fault persisted.

Both flight crew immediately donned oxygen masks.

The PNF declared a MAYDAY and the PF completed a standard operating procedure emergency descent in accordance with the emergency checklist. The aircraft then levelled at FL100 where the MAYDAY was downgraded to a PAN. The aircraft returned to Southampton without further incident.

Information from crew

Cabin crew

In their subsequent air safety report statements, both cabin crew members recalled that they had been completing bar services when they noticed that sandwich packets and coffee cup foils were beginning to burst. One cabin crew member stated "…as I was walking to the rear of the galley my ears were popping and I felt short of breath, my legs felt weak." Both cabin crew utilised oxygen bottles to regain composure and to refocus. One cabin crew member mentioned "I called the flight deck but there was no answer and I was worried that they were ok." Soon after, an announcement was made from the flight deck over the PA system saying, "this is the Captain, emergency descent is now complete." The cabin crew reported that several passengers complained of sore ears.

Commander

The commander's narrative description of events stated that pressurisation checks were normal during the climb when checked at FL100 and FL200. During the level off to FL240, the cabin rate of climb was observed to be 1,500 ft per minute and increasing. This was shortly followed by the pressurisation fault annunciator.

In his narrative, the commander explained that "the selection of pressure controller to MAN then back to AUTO was/is a known/approved method of clearing pressure fault light." When this did not appear to rectify the situation, both pilots went on to oxygen, just before the master warning sounded.

The commander also stated that neither member of the flight crew remembered hearing the call bell when the cabin crew attempted to contact the cockpit.

Recorded information

The information recorded on the FDR and CVR in relation to the depressurisation event, and the subsequent actions taken, is consistent with the information provided by the flight crew.

Engineering examination

Interrogation of the aircraft's Central Diagnostic System records identified the aft pressure outflow valve as the pressurisation failure mode. Following replacement of the suspected faulty valve, a functional test determined all operations of the component to be normal. In addition to replacing the outflow valve, all aircraft door seals and air conditioning ducts were inspected but no defects were evident. This was followed by a full operational test of the pressurisation system which was completed successfully and the aircraft has since been returned to service. After replacement of the aft outflow valve there was no recurrence of the reported event.

Following the incident, the aircraft operator returned the suspected faulty outflow valve to the component manufacturer for investigation. Fitted at build in 2005, the valve had completed 7,493 hours, 8,649 cycles at removal. Over the 12 months to 12/01/2010, the MTBUR (Mean Time Between Unscheduled Removals) for this part with this operator was 20,855 hours.

Outflow valve history & related events

The operator perceived the reliability of the outflow valve on this aircraft type to be a continuing concern,

which it believed was being addressed by both the aircraft and component manufacturer. However, the aircraft manufacturer has stated that the reliability of the aft outflow valve is within tolerable limits according to its Failure Recording And Corrective Action System (FRACAS). The type of aft outflow valve fitted to G-JECN at the time of the incident was not the most recent revision of the component.

Since the build date of G-JECN, the aft outflow valve has been redesigned twice by the manufacturer. The first revision introduced a noise filter in the actuator part of the outflow valve software. The introduction of the noise filter was intended to improve reliability but this may not have had the desired effect[1]. The redesigned outflow valve was fitted on aircraft G-ECOB and to subsequent aircraft from production, but not to G-JECN. Of the seven aircraft delivered to the aircraft operator with redesigned valves, the operator had experienced at least five failures.

The aircraft manufacturer has recently released SB84-21-09 that introduces a further revised aft outflow valve, which corrects the issue introduced by the previous version.

Analysis

Outflow valve

The root cause of the suspected outflow valve failure on G-JECN had not determined by the component manufacturer at the time of writing. However, based upon evidence obtained from the Central Diagnostic System post-incident, in conjunction with G-JECN's uneventful return to service following replacing the suspected faulty part, it is probable that the aft outflow valve was the source of the depressurisation.

Passenger address and interphone system

After the incident flight, the passenger address and interphone system was tested and was found be operating satisfactorily. A review of the technical history of the system did not reveal any defects relating to an inability to hear the call bell in the cockpit.

Post-incident analysis of the CVR revealed that the audible call bell could be heard in the cockpit but neither member of the flight crew reacted to it. The call bell sounded shortly after the flight crew opted to use oxygen masks, during a period where they were busy trying to establish initial communications with each other. The CVR revealed that a member of the flight crew mentioned that he was experiencing pain with his ears as a result of the depressurisation, which may have been a contributory factor in not being able to hear the call bell. In this instance, the flight crew restored communications with the cabin crew upon reaching FL100, thereby allaying the concerns that the cabin crew had had for the welfare of the flight crew.

Footnote

[1] DH8-400-SL-21-014 refers.