INCIDENT

Aircraft Type and Registration:	Airbus A321-231, G-MIDC
No & Type of Engines:	2 IAE V2533-A5 turbofan engines
Year of Manufacture:	1998
Date & Time (UTC):	13 November 2006 at 1647 hrs
Location:	Dublin Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 7 Passengers - 129
Injuries:	Crew - None Passengers - None
Nature of Damage:	Loss of hrust reverser blocker door
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	54 years
Commander's Flying Experience:	15,000 hours (of which 1,800 were on type) Last 90 days - 240 hours Last 28 days - 80 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and follow-up AAIB investigation

Synopsis

During a post-landing walk-around check at London Heathrow Airport (LHR), the flight crew noticed a blocker door missing from the left engine by-pass duct; the acoustic panels lining the duct itself had also been damaged. The loss of the blocker door was found to have been caused by failure of the door mounting lugs, due to corrosion cracking and the seizure of a blocker door hinge bearing. The manufacturer is investigating several similar failures and will take action to minimise the possibility of additional failures of this nature when their investigations are complete.

History of the flight

The aircraft had completed a flight from Dublin to LHR when, during a post-flight walk-around inspection, the flight crew observed that the acoustic panels lining the interior of the left engine by-pass duct had been damaged and that a thrust reverser blocker door was missing, Figure 1. No defects had been observed during the pre-flight inspection at Dublin, no unusual vibrations or noises were noticed during the flight and the aircraft had not recorded any defects in its fault monitoring systems. The remains of the blocker door were found adjacent taxiway E7 at Dublin Airport.

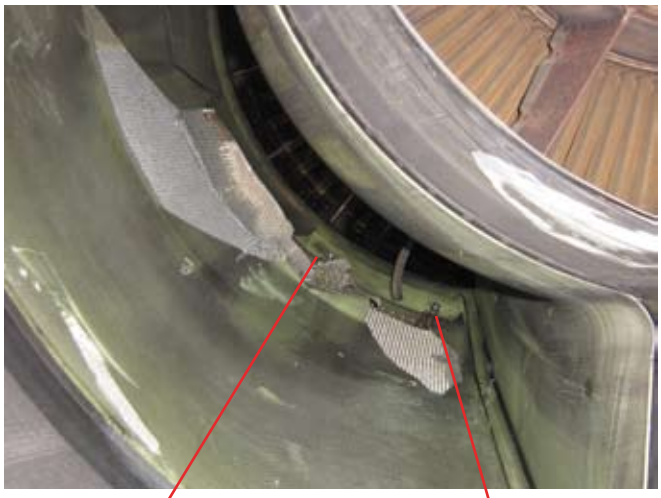

Figure 1

Damage to by-pass duct (view looking forward)

Investigation

In response to a request from the Irish Accident Investigation Unit, the AAIB conducted an investigation into this incident and the blocker door, together with its mounting hardware from the thrust reverser, were dispatched to the AAIB for examination.

Blocker door description

The blocker door consists of a rolled and machined aluminium alloy 'plate', secured to the translating sleeve of the thrust reverser by two hinges located towards the forward edge of the door. Each hinge consists of a stainless steel spherical plain bearing pressed into a lug in the door structure. Each lug sits within a bracket on the thrust reverser sleeve and is held in place by a bolt which passes through the bracket and the bearing. A hinged arm located towards the rear of the door is secured to the inner fixed section of the thrust reverser. When the reverser operates and the translating sleeve moves aft, the blocker door is pulled across the bypass duct by the hinged arm.

Detailed examination

Examination of recovered material showed that the door actuation arm had failed due to an overload condition, and that the lugs on the forward edge of the door, into which the bearings had been located, had both failed, Figure 2.

The bearings had remained in their respective mounting brackets on the reverser translating sleeve. Laboratory examination of the fracture surfaces of both lugs showed areas of inter-laminar and inter-granular corrosion cracks, at the lug holes, suggesting stress corrosion. Overload failure areas towards the rear of each lug were also observed. The lower lug had also been distorted due to the application of a torsional load prior to failure.

Examination of the bearings showed that the upper bearing had seized in its race. Some evidence of corrosion staining was present between the bearing roller and race and it was noticed that evidence of primer residue was present between the inner surface of the lug holes and the spherical bearings.

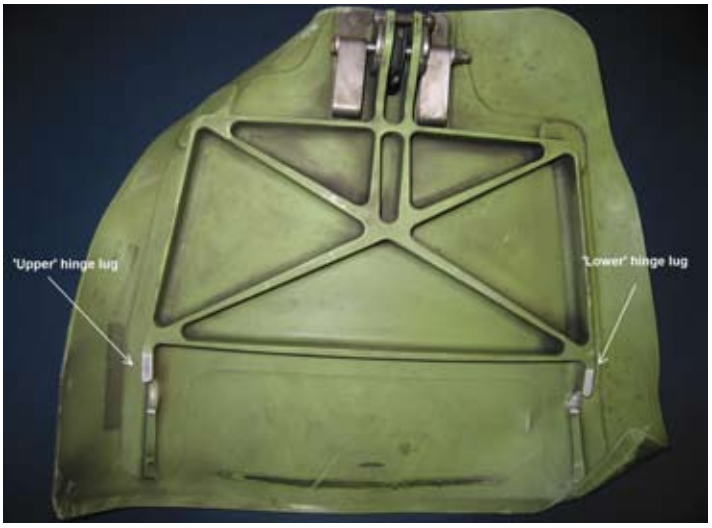

Figure 2

Blocker door, showing failed hinge lugs

Blocker door maintenance history

The records for the blocker door indicated that it had been inspected and repaired by a Maintenance Repair Organisation (MRO) in December 2002, and was subsequently fitted to G-MIDC in February 2005 during a 'C' check. Discussion with various operators and MROs confirmed that previous cases of cracked bearing lugs were attributed to stresses introduced during the bearing installation process. However, tests carried out on the door whilst at the MRO established that no cracks were present in the lugs at that time.

A review of the maintenance program for the aircraft showed that there is no requirement to carry out routine lubrication of the blocker door bearings.

Analysis

Deformation of the lower lug indicated that the upper lug failed first, which resulted in the failure of the lower lug and the actuation arm, which allowed the blocker door to be released.

The use of a stainless steel bearing in the aluminium lug would have provided a source of galvanic corrosion and, therefore, an initiator for the corrosion cracking observed. In order to minimise this possibility, blocker doors are primed prior to the installation of the bearings; residue found in the lug holes confirmed that primer had been present. However, clear evidence of corrosion cracking in both lugs was present. This was probably as a result of galvanic corrosion between the steel bearing and aluminium alloy blocker door, and it is possible that the primer was of insufficient thickness to prevent this happening, or had become damaged during the installation of the bearings. The seized upper bearing would have introduced additional torsional loads in the door lugs, accelerating the rate of crack propagation.

Safety action

The manufacturer is currently investigating several similar events and will, based on the results of these investigations, take action to minimise the possibility of additional failures of this nature. In view of this, no Safety Recommendations are considered necessary to be made at this time.