INCIDENT

Aircraft Type and Registration:	Boeing 757-204, G-BYAT
No & Type of Engines:	2 Rolls-Royce RB211-535E4-37 turbofan engines
Year of Manufacture:	1994
Date & Time (UTC):	15 February 2010 at 1800 hrs
Location:	Stand 28, Glasgow International Airport
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 8 Passengers - 230
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damaged recirculation fan
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	60 years
Commander's Flying Experience:	18,000 hours (of which 13,000 were on type) Last 90 days - 23 hours Last 28 days - 11 hours
Information Source:	Field Investigation

Synopsis

Shortly after arriving on stand at Glasgow International Airport, and after passenger disembarkation had commenced, the flight and cabin crews noticed an acrid smell throughout the aircraft. The senior cabin crew member then ordered an evacuation over the passenger address system. The cabin crew deployed the emergency evacuation slides at both rear doors and a total of 43 passengers exited the aircraft using these slides. Four passengers received minor injuries. The flight crew were not aware that an evacuation had been initiated until after the event.

The electrical burning smell was traced to the right recirculation fan.

History of the flight

G-BYAT landed at Glasgow International Airport after an uneventful flight from Funchal, Madeira. Shortly after coming onto stand, after passenger disembarkation had commenced, via door L2, the flight crew became aware of an acrid smell that appeared to be getting stronger. The co-pilot left the cockpit briefly, to identify whether the smell was also present in the forward galley; it was and was increasing in intensity, but there was no visible smoke in the cabin. The co-pilot returned to the flight deck and informed the commander, who turned off the APU and the Utility busbars to isolate electrical power to the galleys, before completing the relevant elements of the Smoke Removal checklist from the Quick Reference Handbook. The fire services were then requested via the ATC ground controller. At this

stage it was apparent to the flight crew that the smell was dissipating.

At the same time the senior cabin crew member (SCCM) and other cabin crew members were aware of the smell. She went into the flight deck and confirmed with the flight crew that the odour was also apparent there.

The SCCM then returned to the forward cabin and contacted all the crew using the Alert Call on the cabin interphone. They confirmed that there was a pungent burning smell throughout the cabin; there was no smoke, but the smell was strongest in the rear of the aircraft. However, the flight crew did not respond to this call.

The SCCM returned to the flight deck to update the commander, and while the flight crew acknowledged her presence, she did not convey her concerns on the need to evacuate the passengers as the flight crew were busy dealing with the incident. She considered that she needed to disembark the passengers as quickly as possible and so, as there were no steps at the rear of the aircraft, when she returned to the cabin she announced, in a calm manner, over the passenger address system: "Please evacuate the aircraft as quickly as possible. Leave all hand baggage behind." The cabin crew at the rear doors re-armed their doors and deployed the slides. A total of 43 passengers used the slides, with four of them receiving minor injuries.

Once the cabin crew had checked the cabin was clear of passengers, they were directed off the aircraft, via the airbridge at door L2, by the AFRS who had boarded the aircraft via the airbridge wearing breathing apparatus. The passengers who had evacuated the aircraft were assisted at the foot of the slides by the AFRS and airport personnel.

After the evacuation a number of comments were made by passengers concerning an apparent lack of assistance and direction given to them outside the aircraft. The airfield operator considered this was due to some agencies not being initially informed of the incident. In addition, there were reports of passengers, coming down the slides, colliding with those in the process of leaving the bottom of the slides.

Following the event the operator's maintenance engineers traced the problem to the right recirculation fan, which was described as "barely running and giving off the burning smell". The unit was replaced, following which the air conditioning packs and fans were run with no further smell of burning. There was no other damage to the aircraft.

SCCM comments

Following the event, the SCCM commented that the whole incident, from the initial smell to the time of the evacuation, happened very quickly. She added that given similar circumstances, with no rear steps in place and with the very distinct smell of burning in the rear of the aircraft, she would again consider initiating an evacuation.

Operations Manual

Part B of the operator's Operations Manual includes the following in the section on evacuation drill, dealing with the command for evacuation and leaving the aircraft:

> ***'On evacuation command***
>
> - *In most circumstances the evacuation command will be initiated by the Commander. This will immediately cause the cabin crew to put into action their evacuation drill. If communication is impossible with the*

pilots and the situation is life-threatening to passengers and crew (e.g. breaking up of the aircraft, an uncontrollable fire in the cabin or ditching), the ICM will initiate the evacuation. However circumstances may also dictate that any cabin crew member initiates the evacuation if faced with a similar situation."

Leave aircraft

- *Cabin crew should leave the aircraft once all passengers have evacuated, or if at any time the area becomes too dangerous to remain inside.*
- *Cabin crew to take control of groups of passengers and move them away from the aircraft upwind (using megaphones).*
- *Attempt to keep passengers together.'*

Examination of the recirculation fan

Conditioned air supply for the aircraft is provided by two air conditioning packs and is distributed to various zones via a 'mix manifold' where it is mixed with recirculated, filtered air, which is supplied by the left and right recirculation fans. The fans have different part numbers, with the right fan being designated as the 'main' unit. The slower-running left unit is operated as a back-up. The left and right recirculation fans are powered from the left and right Utility buses respectively, via a 20 amp circuit breaker. The right hand fan has a 3-phase motor, running at a nominal 11,400 rpm and drawing a maximum of 13 amps per phase. A diagram of the assembly is shown at Figure 1.

Following removal of the defective unit, which had the Part Number 606772-3, it was found that the impeller/motor assembly could be turned by hand, although it was 'notchy' in operation and would not run freely. Accordingly, it was examined, under AAIB supervision, at the manufacturer's UK overhaul facility.

Initially, the unit was placed on a test rig but the fan turned only briefly before the 68 amp rig circuit breaker tripped. The unit was disassembled and it was clear that the rear rotor bearing had failed (Figure 2). The radial play that had occurred at this end of the shaft had resulted in contact between the rotor and stator, which had resulted in smearing of the segments and the consequent generation of debris, mostly in the form of black dust.

Examination of the bearing components indicated that the fibre bearing cage had disintegrated and that there was no evidence of grease with which the bearing had been packed. Fragments from the bearing grease shield were found, which suggested that this may have come loose, leading to the escape of the grease and the subsequent bearing failure. Circumferential score marks on the external surface of the bearing outer race indicated that it had been spinning within its housing; this may have occurred as a result of friction generated within the bearing during the break-up process. It was also noted that grease had started to run out from the otherwise intact front bearing (ie fan end), indicating that the unit had been running in a hot condition.

It was observed that the electrical wiring within the fan assembly appeared to be in good condition, with no evidence of burning or charring. Thus the burning smell that led to the evacuation of the aircraft was likely to have been caused by burning grease. The unit was equipped with a thermal cut-out that would shut it down in the event of an overheat condition. This was checked and it was found that the unit cut out at

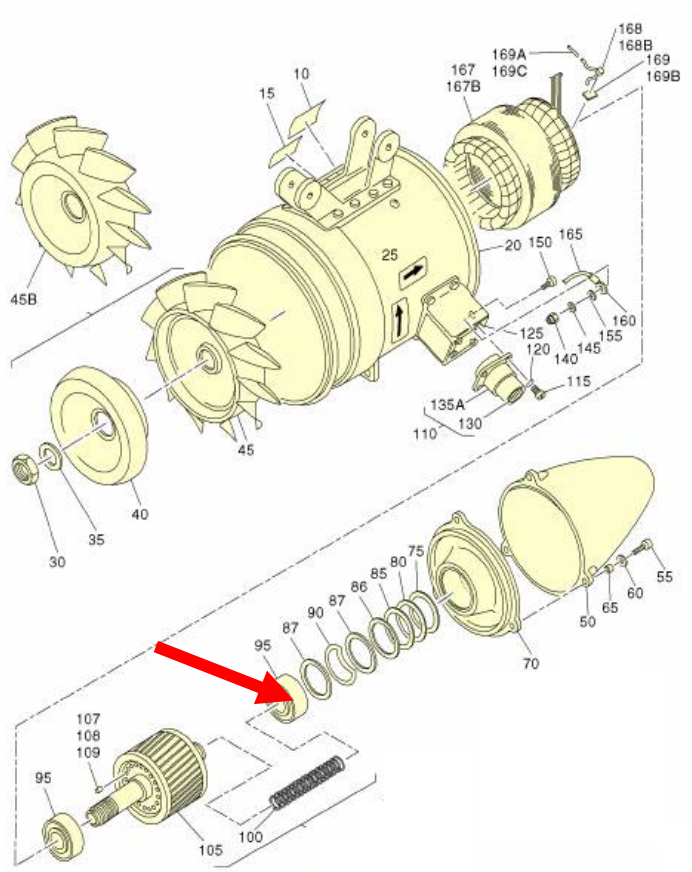

Figure1

Exploded view of the recirculation fan; position of failed bearing indicated

Figure 2a

View of rotor and failed bearing

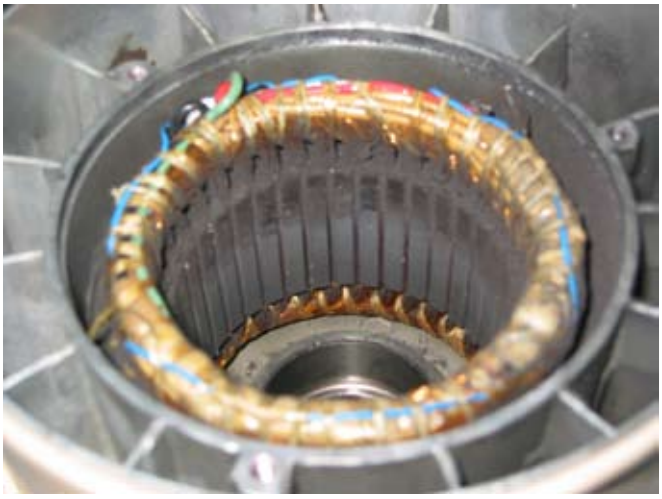

Figure 2b

View of contact damage from rotor

a temperature of 156.6ºC and, during cooling, reset at 145ºC. This compared with the manufacturer's specifications of a maximum of 154ºC and a minimum reset temperature of 126ºC.

History of the recirculation fan

The recirculation fan in this incident had most recently been inspected during a 'C' check in January 2010, 189 flying hours earlier. This was a scheduled check, which included a general clean together with fore and aft bearing replacement.

The airline had experienced a number of similar failures with recirculation fans, which also equip their Boeing 767 fleet. The reasons for some of the failures were not always apparent from the available documentation, although it was clear that bearing failures had occurred in some cases. The fan manufacturer noted that the latest revision of the Component Maintenance Manual (CMM) now includes bearings from an alternative manufacturer as an option. This new bearing has a retaining pin with a larger diameter, which is considered to be potentially more robust than the old component. The operator intends to use the new bearing during overhauls, when they become available in 2011.

Discussion - evacuation

In this particular case, it is clear that the member of the cabin crew who initiated the evacuation was concerned that the situation in the cabin was potentially life threatening. However, the flight crew were not incapacitated and it is evident that verbal communication with them would have been possible had the member of cabin crew persisted.

Safety actions

Following this incident, the aircraft operator issued a Cabin Crew Notice reminding cabin crew of the circumstances when an evacuation can be initiated without it being ordered by the commander, and of the cabin crews' responsibilities for the evacuated passengers.

In response to the concerns of passengers, and others, of an apparent lack of assistance and direction given to passengers outside the aircraft, the airport operator has reviewed and amended the accident and incident communications process for Customer Services Duty Managers. This now ensures that all agencies, including all resident aircraft operators and handling agents, are informed automatically of any accident or ground incident.