

SERIOUS INCIDENT

Aircraft Type and Registration:	Airbus A321-131, D-AIRX	
No & Type of Engines:	2 IAE V2530-A5 turbofan engines	
Year of Manufacture:	1998 (Serial no: 0887)	
Date & Time (UTC):	21 October 2012 at 0710 hrs	
Location:	On approach to London Heathrow Airport	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 6	Passengers - 139
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	42 years	
Commander's Flying Experience:	11,950 hours (of which 1,700 were on type) Last 90 days - 160 hours Last 28 days - 40 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and additional AAIB enquiries	

Synopsis

Whilst on the approach into London Heathrow a strong smell became apparent on the flight deck, which resulted in eye and throat irritation being experienced by both pilots. Having established that there was a similar problem in the cabin, both pilots donned oxygen masks and, following an expedited clearance, landed the aircraft without further incident. Despite medical examinations of the affected crewmembers and an investigation, by the operator, of the engines and air conditioning system, no explanation for the odour or symptoms experienced by the crew could be found.

History of the flight

After passing Flight Level 120 on the approach to London Heathrow the co-pilot noticed a strong smell, which was accompanied by eye and throat irritation. The commander used the interphone to call the purser, who confirmed that there was also an odour in the cabin and that she was experiencing the same symptoms as the co-pilot. The co-pilot was by now feeling dizzy and nauseous; both crew then donned their oxygen masks and requested priority landing clearance.

After an uneventful approach the aircraft landed within 10-15 minutes of the onset of the smell. The aircraft was halted on a parallel taxiway and the engines and air conditioning were shut down. The commander then informed the crew, passengers, ground control and the

Fire Service of the situation and the aircraft was towed to its parking location. After shutting the engines down, the situation in the cabin improved, although a few passengers reported light throat irritation.

The co-pilot continued to feel nauseous and dizzy and the other crewmembers still complained of eye and throat irritation. As a result the entire crew were sent to a local hospital for examination. They were released after several hours, by which time their condition had improved and the results of blood tests, taken earlier, produced no medical findings. The crew returned to their base in Frankfurt where they immediately went to a hospital for further examination. Once again, the test results revealed nothing abnormal.

The investigation

Whilst at Heathrow, the engines were subjected to a comprehensive inspection that checked for oil traces and residues. The most recent oil uplift, for both engines, was on 12 October 2012, 9 days prior to the incident. The only finding was some droplets of “dirty rainwater” within the high pressure compressor and in the reverser cowl. Subsequent laboratory analysis indicated the presence of salts that possibly could have come from de-icing fluids. The relevant records indicated that the aircraft had not been de-iced since 14 April 2012. Sulphur was also found, although there was no indication, or even speculation in the laboratory report, as to its likely origin.

Inside the aircraft the flight deck and cabin lights were checked for function and traces of odour, with no findings. The circulation fans were checked and the recirculation and avionic filters were inspected and replaced. The recirculation filter was later subjected to gas chromatography analysis: although some engine oil traces were found, these were similar in quantity to those

found in the filter from another aircraft in the fleet with similar flying hours but which had no history of unusual odours or crew incapacitation. Finally, checks were conducted on equipment in the galley and toilet areas, - all with no findings.

During the subsequent ferry flight from Heathrow to Frankfurt, several configurations of the environmental control system were tested under different engine power settings. During the tests the cabin air quality was assessed by an electronic analyser; the results revealed no evidence of engine oil or any other abnormalities. (Note: as the auxiliary power unit was turned off at the time of the incident, it did not form part of this investigation.)

After arriving in Frankfurt the engines were inspected again, including a check on the low-pressure shafts for signs of oil residue or carbon build-up, and a similar inspection, using a borescope, of the sump and fan module areas; nothing was found. The high pressure compressors of both engines were also inspected with a borescope, with “old birdstrike debris” being found in stages 3 and 4 on the No 2 engine. This was not thought to be linked to the odour observed during the incident.

Discussion

The investigation was inconclusive in that a source of the apparent contamination of the cabin and flight deck air was not found, despite the detailed analysis of residues and the medical examinations of the affected members of the crew. This event thus joins a growing number of cases in which there has been a similar lack of conclusive evidence as to the cause(s) of aircraft cabin air quality issues.

Over the years there have been numerous reviews, studies and research projects on air quality events,

conducted in a number of countries. There is a general acceptance that cabin air can be contaminated by compounds released in pyrolysed oil from engines and auxiliary power units. As an example, some events on early models of Rolls-Royce RB211-535C-powered Boeing 757 aircraft were attributed to overfilling with engine oil. Modern lubricants contain synthetic additives, including organophosphates, which can have adverse effects on the nervous system. Additional contamination can result from substances such as hydraulic oil, de-icing fluids, smog and industrial pollution being ingested by the engines before being distributed around the aircraft by the air conditioning system.

In the United Kingdom, a Civil Aviation Authority analysis of Mandatory Occurrence Reports¹ (MORs) indicated that ‘fume events’ occur on approximately 0.05% of all commercial passenger and cargo flights. In most cases the effects on aircrew take the form of ‘acute’ symptoms, such as eye and throat irritation, as experienced by the crew of D-AIRX, although long term health issues have been recorded. However, inconsistent reporting is thought to have affected the quality of the evidence. It is also worth noting that in tests where measurements of contaminants have been taken, the concentration is invariably well below internationally agreed levels for occupational exposure.

Footnote

¹ References and extensive supporting literature can be found in numerous sources, including the 2010 Australian Civil Aviation Safety Authority (CASA) Expert Panel on Aircraft Air Quality (EPAAQ) Final Report, and in the summary report, Health Effects of Contaminants in Aircraft Cabin Air, by Prof Michael Bagshaw, October 2012.