INCIDENT

Aircraft Type and Registration:	Airbus A340-642, G-VGOA
No & Type of Engines:	4 Rolls-Royce Trent 556-61 turbofan engines
Year of Manufacture:	2001
Date & Time (UTC):	30 December 2005 at 1528 hrs
Location:	After takeoff from London Heathrow Airport
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 18 Passengers - 308
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	43 years
Commander's Flying Experience:	11,238 hours (of which 2,092 were on type) Last 90 days - 173 hours Last 28 days - 73 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

During takeoff part of the cabin filled with a light white mist and an accompanying 'oily' smell. The flight crew declared a PAN, dumped fuel and then made an uneventful return to the airport. The mist was probably caused by the ingestion of oil or other contaminant into the APU inlet which passed into the bleed air duct and cabin air conditioning system. The fluid contaminant probably emanated from a drain hole forward of the APU inlet. This drain hole was found blocked some time after the incident and, once cleared, it released almost a litre of an oil-water mixture.

History of the flight

The aircraft was on a scheduled flight from London Heathrow to Los Angeles. During the takeoff rotation a section of the cabin filled with a light white mist. The mist was accompanied by a smell which was described as 'oily' by the cabin crew. The Flight Services Manager (FSM), head of the cabin crew, notified the commander over the intercom that there was "smoke in the cabin". The flight crew had also become aware of an 'oily-type' smell on the flight deck, although no smoke or mist was present. The commander completed the after takeoff checks and then, after levelling off at a safe altitude, he asked the relief First Officer (who was occupying the jump seat) to enter the cabin and assess the situation. He reported back that the 'smoke/mist'

had disappeared from the cabin and this was confirmed by the FSM. However, the 'oily' smell still lingered in the cabin.

The commander decided to return to Heathrow and declared a PAN (urgency call) to Air Traffic Control (ATC). The flight crew actioned the 'Smoke/Fumes Removal' checklist and then advised the FSM and the passengers of the situation. The aircraft was above its maximum landing weight so it was vectored by ATC to a suitable area to jettison fuel. Whilst jettisoning fuel the flight crew reviewed all the systems pages on the ECAM (Electronic Centralized Aircraft Monitoring) but no faults were noted. It took approximately 60 minutes to jettison the 83 tonnes of fuel required (1.38 tonnes/min). The subsequent approach and landing back at Heathrow were uneventful.

A fire service vehicle attended as the aircraft vacated the runway and a visual inspection of the aircraft was carried out; nothing unusual was noticed. The aircraft was then taxied to a remote stand where the passengers were disembarked.

Aircraft examination

The aircraft was examined by the operator's maintenance engineers to determine the source of the white mist and 'oily' smell. High-power engine runs were carried out while bleed air was selected from each engine in turn but no leaks or fumes were detected. It was the operator's standard practice on the A340-600 to have the auxiliary power unit (APU) operating during takeoff until a height of 1,500 ft had been reached. Therefore, the APU was also test-run but no leaks or fumes were detected. The galley equipment and the in-flight entertainment system were also operated but no faults were found. The APU had not been serviced recently so an oil over-servicing problem was discounted. To help identify the cause of the mist, the aircraft was operated on an additional seven flights with the APU inoperative and no smells or mist were reported during those flights. During a subsequent A5 maintenance check a slight 'oily' smell was noted after selecting bleed air from the APU, but an inspection of the APU bay did not reveal any evidence of an oil leak. The aircraft was released back to service with the APU still inoperative.

When the aircraft arrived in Johannesburg on a subsequent flight, additional down-time was available for troubleshooting the problem. A detailed inspection of the APU and its associated air conditioning ducts was carried out but no faults were found. However, a trace of an unknown fluid was detected on the underside of the fuselage, aft of the APU inlet. The area was cleaned and the APU was run but there was no report of mist or smells in the cabin. After the test run, no leaks inside the APU bay were found. A flight test was then carried out with the APU operating but again no mist or smell was detected.

A week later, during a routine inspection of the APU, an engineer noticed a small drain hole (approximately 1/8 inch in diameter) located aft of the curved APU diverter[1] (see Figure 1). He reported that it was very difficult to spot. When he attempted to check if the hole was clear almost a litre of an oil-water mixture drained out. The panel containing the drain hole was removed and the area inside was found to be wet and contaminated. The operator suspected that a build-up of dirt and dried oil had blocked the hole.

Footnote

1 The curved diverter on the underside of the aircraft, forward of the APU inlet, serves to divert any fluid streaming aft along the fuselage's underside from entering the APU. It does not prevent fluid from the drain hole entering the APU.

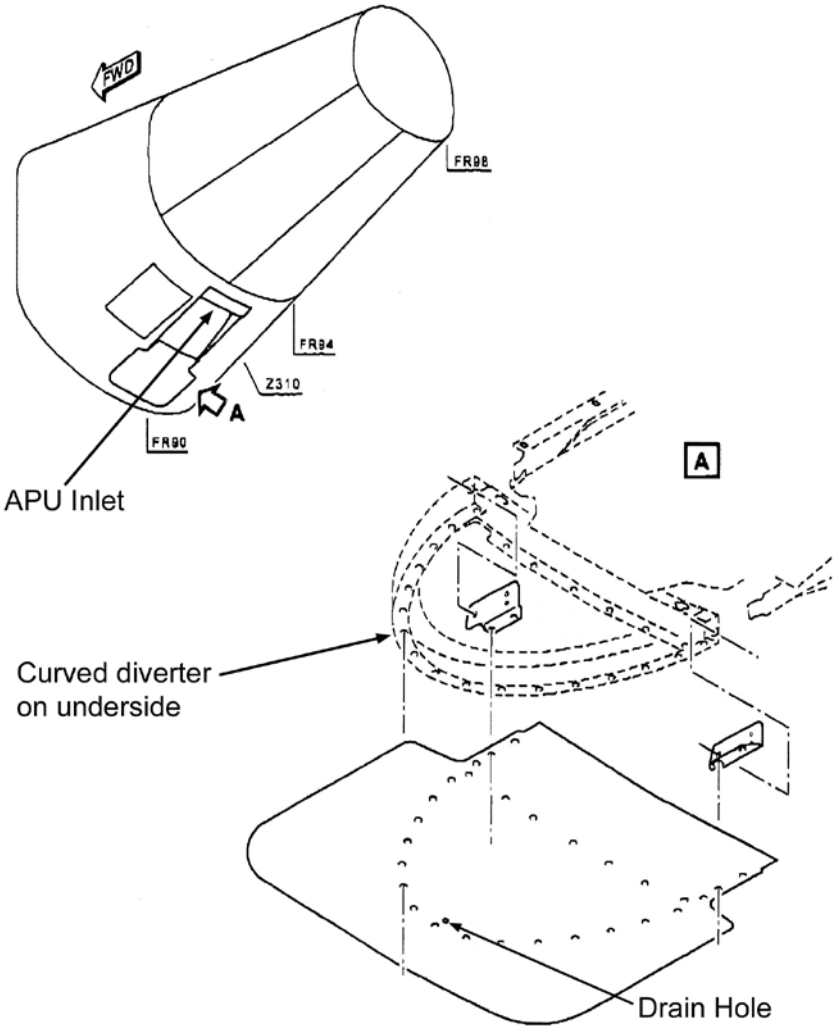

Figure 1

Location of drain hole relative to diverter and APU inlet

Fuel jettison rate

It took approximately 60 minutes to jettison 83 tonnes of fuel (1.38 tonnes/min), which was a slower rate than the 1.6 tonne/min figure published in the aircraft maintenance manual. The aircraft manufacturer stated that tests of the A340-600 fuel jettison system had produced jettison rates of between 1.83 tonne/min and 2.08 tonne/min, but that no tolerance band could be given because the actual rate was dependent upon aircraft attitude, wing bending, aircraft centre of gravity and the fuel temperature. At the time of writing, the AAIB had not received any response from the aircraft manufacturer explaining the low fuel jettison rate on G-VGOA.

Discussion

The crew of the aircraft were able to handle the situation and made a safe return to the airport. The commander reported that he received "excellent support" from ATC during the incident.

A build-up of dirt and oil in the drain hole aft of the diverter had caused a blockage which prevented oil

and other fluid contaminants draining overboard. If this blockage were to unblock suddenly, for example due to the vibration during a takeoff, then the released fluid could easily be ingested by a running APU. Once ingested this contaminant could pass into the bleed air duct and subsequently into the cabin air conditioning system. This scenario probably explains the oily smell and mist observed in the cabin during takeoff.

Follow-up action

In response to this incident, the operator decided to raise a new maintenance task requiring an inspection of the drain hole at every A check. The aircraft manufacturer was informed of the decision. The reason for the low jettison rate had not been determined by the aircraft manufacturer at the time of writing.