SERIOUS INCIDENT

Aircraft Type and Registration:	Boeing 747-436, G-CIVB
No & Type of Engines:	4 Rolls-Royce RB211-524G2-T-19 turbofan engines
Year of Manufacture:	1993
Date & Time (UTC):	11 July 2009 at 0310 hrs
Location:	Pheonix, Arizona, USA
Type of Flight:	Commercial Air Transport (Passenger)
Persons on Board:	Crew - 18 Passengers - 300
Injuries:	Crew - 1 (Minor) Passengers - some (Minor)
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	18,235 hours (of which 6,529 were on type) Last 90 days - 215 hours Last 28 days - 63 hours
Information Source:	AAIB Field Investigation and operator's internal investigation

Synopsis

The engines were being started during pushback when fumes and smoke were noticed in the cabin. The commander decided to return to the stand; however, there was some delay while the tug was reconnected. The intensity of the fumes increased and as the aircraft came to a halt on the stand an emergency evacuation was carried out. An extensive engineering investigation after the event was not able to provide any explanation for the origin of the fumes. The aircraft was returned to service and no further instances have occurred.

This serious incident occurred in the USA. In accordance with Annex 13 of the ICAO Convention on Civil Aviation, an investigation would normally be carried out by the State of Occurrence. On this occasion, it was agreed with the National Transportation Safety Board (NTSB) that it would be more appropriate for the State of the Operator, ie the UK, to conduct the investigation.

History of the flight

There were three pilots on the flight deck: the aircraft commander in the left seat, the co-pilot, nominated as pilot flying, in the right seat, and an additional pilot on the jump seat. There were 15 cabin crew members.

Pushback

The aircraft pushed back at 0244 hrs from stand B25 at Phoenix Sky Harbour Airport. The aircraft stand area

and Taxiways Quebec and Romeo behind the aircraft were not visible from the Air Traffic Control Tower. The weather conditions at the time were: surface wind from 260º at 8 kt, CAVOK, temperature 41ºC, dewpoint 2ºC, pressure 1008 hPa, and the incident occured during the hours of darkness.

The engines were all started during the pushback; the No 4 engine was started first followed by the No 3. About a minute after the No 4 engine start, the additional pilot noticed an acrid burning smell. The cabin crew also noticed this smell and contacted the flight deck crew to advise them.

On the flight deck, the fumes intensified and the pilots put on their oxygen masks. The additional pilot then took off his mask in order to go back into the cabin to assess the situation outside the flight deck. The co-pilot asked the ground crew headset operator (who was a company maintenance engineer) if there was any unusual smell outside. He replied that there was only a smell of burning rubber from a recently landed aircraft. The flight crew opened the overhead emergency escape hatch in an attempt to clear the fumes from the cockpit, but this was ineffective.

Return to stand

At 0250 hrs, the commander decided to return to the stand and disembark the passengers. The engines were shut down and the headset operator was advised. A PAN call was made to ATC in which the commander requested that a set of steps be brought to the aircraft. He also notified the cabin crew and instructed them to return the doors to the 'manual' position.

At 0254 hrs the tug was reconnected, but as the aircraft had been pushed back through an angle of more than 90º, and then pulled forward, the tug had to manoeuvre several times to align the aircraft with the stand. This operation was accomplished by 0258 hrs.

Meanwhile in the cabin, the situation had deteriorated, particularly at the rear of the aircraft. Several passengers left their seats and moved forward wanting to get off the aircraft. One passenger called out that there was a fire. The two cabin crew members positioned at doors 3L and 4L, in the most intense area of fumes, left their doors to look for the source. They saw "whitish smoke" coming from the sidewall and discharged a fire extinguisher under the seats in the area. More passengers had now left their seats and one passenger then opened the now unattended door 3L; the cabin crew were unable to return to the opened door because of the number of passengers in the vicinity. The cabin evacuation alarm was triggered at door 3L, but it is not certain by whom. The crew member at 4R contacted the flight deck again and advised that there was smoke and possible fire in the cabin. The commander advised ATC that there was a fire on board and made a request for the emergency services to attend the aircraft. By now, many of the passengers had left their seats. Some with children were being assisted in the galley area by the crew and wet towels were handed out. The senior cabin crew member, who was by the exit/entry door 2L on the lower deck, was surrounded by anxious passengers and was not in a position to be able to control the situation in the cabin.

Evacuation

The commander realised the situation was deteriorating and decided to evacuate the aircraft. He made an announcement for the crew to put the doors to 'automatic' and then gave the evacuation command; because of the proximity of the airbridge, he instructed that evacuation should be from the right side of the aircraft.

The doors on the right side of the aircraft were opened and the slides all deployed successfully. The left upper deck door was opened in error and the slide deployed on top of the airbridge. The cabin crew member at this door had not heard the instruction to evacuate on the right, but when he saw the slide had not properly deployed he guarded the door and redirected the passengers. A member of ground handling staff who was on the airbridge realised the slide was deploying towards her and ran back into the terminal.

At 0258 hrs the passengers started evacuating down the slides onto the apron area. ATC were advised that an evacuation was in progress. A fire team subsequently entered the aircraft, but were unable to detect any heat sources or fire damage on the aircraft.

The passengers were on the apron for about 20 minutes before they were escorted back into the terminal building.

Engineering investigation

A detailed investigation was carried out over a four day period by the operator, in conjunction with the aircraft manufacturer, and no source of the fumes/smoke could be found. The aircraft was ferried back to the operator's main base where further examination and testing was carried out, but still no source or explanation of the fumes/smoke was found. The aircraft returned to revenue service on 21 July 2009 and has been operating with no recurrence of the problem since that date.

Recorded information

On this aircraft type, data is recorded on the Flight Data Recorder (FDR) and Quick Access Recorder (QAR). The start/stop logic is designed to capture data when at least one engine is running. The FDR records at least 25 hours of data and the QAR in excess of this. The data recorded that was relevant to this investigation did not offer any further insight into the events, other than corroborating the engine and pushback activity described in the History of the flight section of this report.

The Cockpit Voice Recorder (CVR) installation is designed to record audio information when the electrical power is selected on the aircraft, and the CVR fitted is designed to preserve at least the last 2 hours of audio information. Flight crew communications were considered important to this investigation and so the CVR should have provided further insight. However, the CVR continued to run during the maintenance activities carried out after the event, so all the audio information relating to the event was lost.

ICAO Annex 6, Part I, 11.6 states:

> *'An operator shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records and, if necessary, the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with Annex 13.'*

EU-OPS 1.160, '*Preservation, production and use of flight recorder recordings*', requires the following of the operator:

> *'(a) Preservation of recordings:*
>
> *(1) Following an accident, the operator of an aeroplane on which a flight recorder is carried shall, to the extent possible, preserve the original recorded data*

> *pertaining to that accident, as retained by the recorder for a period of 60 days unless otherwise directed by the investigating authority.*
>
> *(2) Unless prior permission has been granted by the Authority, following an incident that is subject to mandatory reporting, the operator of an aeroplane on which a flight recorder is carried shall, to the extent possible, preserve the original recorded data pertaining to that incident, as retained by the recorder for a period of 60 days unless otherwise directed by the investigating authority.'*

The operator provided the following extract from their '*Reporting of Air Safety Accidents and Incidents*' procedure.

> *'Outstation British Airways/British Airways Engineering Duty Staff*
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> *(a) Ascertain as soon as is safely possible, that the Aircraft Cockpit Voice Recorder Circuit Breaker has been tripped by the departing cockpit crew in order that recordings stay intact. Ensure that this occurs if the disembarking flight crew were unable to, or did not complete this task.'*

A review of previous AAIB investigations showed that, out of 99 CVR replays, information was lost in 19 because the operator had not electrically isolated the recorder whilst the aircraft was on the ground. Seven of these events related to 'two-hour' recorders, with the remaining being 'half-hour' recorders. These occurrences were not specific to any one operator, or any particular nationality of operator.

Some operational procedures to preserve recordings are already in place, but the procedures are all too often ineffective. Any procedure that requires the crew to consult with a main base, or reference material not readily available in the flight deck in order to remove power from the CVR, will not be conducive to timely preservation of this evidence. It is considered that procedures should be put in place to ensure that, even if the flight crew successfully remove power from the CVR in a timely manner, subsequent maintenance activity does not include the re-application of electrical power to the recorder. One effective way of preserving CVR and FDR data is to pull and collar the relevant circuit breakers, and physically remove the recorders. Once permission has been granted by the investigating authority, they could then be reinstated.

Therefore, the following Safety Recommendations are made:

Safety Recommendation 2010-011

It is recommended that British Airways plc review their procedures and training of flight and maintenance crews to ensure the timely preservation of Cockpit Voice Recorder recordings in the event of a reportable occurrence, in accordance with ICAO Annex 6 Part I, 11.6 and EU-OPS 1.160. The procedures and training should provide the necessary information and skills to identify when reportable accidents and serious incidents occur, and implement the necessary tasks to preserve flight recordings in a timely manner.

Safety Recommendation 2010-012

It is recommended that the Civil Aviation Authority review the relevant procedures and training for UK operators, to ensure the timely preservation of Cockpit Voice Recorder recordings of a reportable occurrence is achieved in accordance with the requirements of ICAO Annex 6 Part I, 11.6 and EU- OPS 1.160.

Discussion

When the commander made the decision to return to the stand it was in the expectation that a normal disembarkation would be carried out by means of the airbridge, and by an extra set of steps which he had requested. There was a delay of several minutes while the tug was reattached and the aircraft was manoeuvred back onto stand. In this time, although the engines were shut down, the fumes seemed to increase and the situation in the cabin deteriorated.

The flight deck of the Boeing 747 aircraft is physically remote from the lower deck cabin and the commander had to rely on communications from the cabin crew to get "a picture" of the situation. The fumes in the flight deck were not severe initially and were barely noticeable in the upper deck cabin. He would have been reluctant to initiate an evacuation without being certain that it was necessary; the doors of the 747 aircraft are high above the ground and an emergency evacuation down the slides is likely to result in some injuries.

The source of the smoke/fumes in the cabin was not readily identifiable and it was, therefore, difficult for the cabin crew to locate and tackle the problem. Some confusion arose as passengers started to leave their seats and move away from the area. This confusion escalated when one of the passengers called out "fire". Once a fire extinguisher had been used, some passengers may have confused the discharged gas with smoke. Although trained in emergency procedures and in assertiveness, the cabin crew found it difficult to control the situation and keep the commander informed, particularly as the passengers became more distressed. The physical reality of the passengers' behaviour was unlike that experienced by the cabin crew during their training.

Door 3L was opened by a passenger but the slide did not deploy because at that time, prior to the evacuation command, the doors were at 'manual'; the slides deployed successfully on all the other doors that were opened. Some passengers collected hand baggage and carried it with them to the doors. The crew commented that if they took the bags away from these passengers, at some of the doors, there was nowhere to stow these items without possibly causing an obstruction.

The commander had reported that he was returning to stand. As the aircraft parked on the stand he requested the attendance of the emergency services and they arrived on the scene within three minutes.

An extensive investigation after the incident revealed no evidence of smoke or fire. From the description of the fumes by the crew, it seems unlikely that burning rubber from landing aircraft could have been the source.

Safety action

The operator carried out an internal safety investigation and identified some areas where training and procedures should be reviewed in light of experience gained from the incident. In particular, the cabin safety training will be reviewed, with extra consideration given to the management of passenger behaviour in stressful situations, to enable more realistic training to be devised.