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Thank you for downloading this collection of AAIB documents from the investigation into the 17 January 2008 crash of a British Airways 777 at London's Heathrow Airport.

Accident Data

AAIB Reference Number: EW/C2008/01/01
Aircraft Type and Registration: Boeing 777-236, G-YMMM
No & Type of Engines: 2 Rolls-Royce RB211 Trent 895-17 turbofan engines
Year of Manufacture: 2001
Date & Time: 17 January 2008 at 1243 hrs
Location: RWY 27L, London Heathrow Airport
Type of Flight: Commercial Air Transport (passenger)
Persons on Board: Crew – 16, Passengers - 136
Injuries: Crew - 4 (minor); Passengers - 1 (serious), 8 (minor)
Nature of Damage: Aircraft Damaged Beyond Economic Repair

Included in this File: This file includes the contents of the key updates issued by the AAIB prior to the publication of the final accident report.

Additional Information: Additional information about this accident, including links to AirSafe.com podcasts and other content related to this investigation, is located at http://777.airsafe.org/.

Podcast: The podcast *The Conversation at AirSafe.com* at http://podcast.airsafe.org/ highlights current online issues of high interest to airline passengers and the airline safety community. This free podcast is available on iTunes and other major podcast providers. The podcast information page is at http://podcast.airsafe.org

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Initial Report Provided by the Air Accidents Investigation Branch on 18 January 2008

Title: Accident to Boeing 777-236, G-YMMM at London Heathrow Airport on 17 January 2008
Source: http://www.aaib.dft.gov.uk/latest_news/accident__heathrow_17_january_2008___initial_report.cfm
Date Downloaded: 21 January 2008

Following an uneventful flight from Beijing, China, the aircraft was established on an ILS approach to Runway 27L at London Heathrow. Initially the approach progressed normally, with the Autopilot and Autothrottle engaged, until the aircraft was at a height of approximately 600 ft and 2 miles from touch down. The aircraft then descended rapidly and struck the ground, some 1,000 ft short of the paved runway surface, just inside the airfield boundary fence. The aircraft stopped on the very beginning of the paved surface of Runway 27L. During the short ground roll the right main landing gear separated from the wing and the left main landing gear was pushed up through the wing root. A significant amount of fuel leaked from the aircraft but there was no fire. An emergency evacuation via the slides was supervised by the cabin crew and all occupants left the aircraft, some receiving minor injuries.

The AAIB was notified of the accident within a few minutes and a team of Inspectors including engineers, pilots and a flight recorder specialist deployed to Heathrow. In accordance with the established international arrangements the National Transportation Safety Board (NTSB) of the USA, representing the State of Design and Manufacture of the aircraft, was informed of the event. The NTSB appointed an Accredited Representative to lead a team from the USA made up of investigators from the NTSB, the FAA and Boeing. A Boeing investigator already in the UK joined the investigation on the evening of the event, the remainder of the team arrived in the UK on Friday 18th January. Rolls-Royce, the engine manufacturer is also supporting the investigation, an investigator having joined the AAIB team.

Activity at the accident scene was coordinated with the Airport Fire and Rescue Service, the Police, the British Airports Authority and British Airways to ensure the recovery of all relevant evidence, to facilitate the removal of the aircraft and the reinstatement of airport operations.

The flight crew were interviewed on the evening of the event by an AAIB Operations Inspector and the Flight Data Recorder, Cockpit Voice Recorder and Quick Access Recorder were removed for replay. The CVR and FDR have been successfully downloaded at the AAIB laboratories at Farnborough and both records cover the critical final stages of the flight. The QAR was downloaded with the assistance of British Airways and the equipment manufacturer. All of the downloaded information is now the subject of detailed analysis.

Examination of the aircraft systems and engines is ongoing.

Initial indications from the interviews and Flight Recorder analyses show the flight and approach to have progressed normally until the aircraft was established on late finals for Runway 27L. At approximately 600 ft and 2 miles from touch down, the Autothrottle demanded an increase in thrust from the two engines but the engines did not respond. Following further demands for increased thrust from the Autothrottle, and subsequently the flight crew moving the throttle levers, the engines similarly failed to respond. The aircraft speed reduced and the aircraft descended onto the grass short of the paved runway surface.

The investigation is now focused on more detailed analysis of the Flight Recorder information, collecting further recorded information from various system modules and examining the range of aircraft systems that could influence engine operation.

Accident Update Provided by the Air Accidents Investigation Branch on 23 January 2008

Title: Accident to a Boeing 777-236, G-YMMM, on 17 January 2008 - Initial Report Update 23 January 2008
Source:
http://www.aaib.dft.gov.uk/latest_news/accident_to_boeing_777_236__g_ymmm__at_heathrow_airport_on_17_january_2008___initial_report_update.cfm
Date Downloaded: 24 January 2008

Since the issue of the Air Accidents Investigation Branch (AAIB) 1st Preliminary Report on Friday 18 January 2008 at 1700 hrs, work has continued on all fronts to identify why neither engine responded to throttle lever inputs during the final approach. The 150 tonne aircraft was moved from the threshold of Runway 27L to an airport apron on Sunday evening, allowing the airport to return to normal operations.

The AAIB, sensitive to the needs of the industry including Boeing, Rolls Royce, British Airways and other Boeing 777 operators and crews, is issuing this update to provide such further factual information as is now available.

As previously reported, whilst the aircraft was stabilised on an ILS approach with the autopilot engaged, the autothrust system commanded an increase in thrust from both engines. The engines both initially responded but after about 3 seconds the thrust of the right engine reduced. Some eight seconds later the thrust reduced on the left engine to a similar level. The engines did not shut down and both engines continued to produce thrust at an engine speed above flight idle, but less than the commanded thrust.

Recorded data indicates that an adequate fuel quantity was on board the aircraft and that the autothrottle and engine control commands were performing as expected prior to, and after, the reduction in thrust.

All possible scenarios that could explain the thrust reduction and continued lack of response of the engines to throttle lever inputs are being examined, in close cooperation with Boeing, Rolls Royce and British Airways. This work includes a detailed analysis and examination of the complete fuel flow path from the aircraft tanks to the engine fuel nozzles.

Further factual information will be released as and when available.

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Air Accidents Investigation Branch

Department for Transport

AAIB Bulletin S1/2008 *SPECIAL*

ACCIDENT

Aircraft Type and Registration:	Boeing 777-236 ER, G-YMMM	
No & Type of Engines:	2 Rolls-Royce RB211 Trent 895-17 turbofan engines	
Year of Manufacture:	2001	
Date & Time (UTC):	17 January 2008 at 1242 hrs	
Location:	Runway 27L, London Heathrow Airport	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 16	Passengers - 136
Injuries:	Crew - 4 (Minor)	Passengers - 1 (Serious) 8 (Minor)
Nature of Damage:	Aircraft damaged beyond economic repair	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	43 years	
Commander's Flying Experience:	12,700 hours (of which 8,500 hours were on type) Last 90 days - 85 hours Last 28 days - 52 hours	
Information Source:	Inspectors Investigation	
	All times in this report are UTC	

The investigation

The Air Accidents Investigation Branch (AAIB) was informed of the accident at 1251 hrs on 17 January 2008 and the investigation commenced immediately. The Chief Inspector of Air Accidents has ordered an Inspector's Investigation to be conducted into the circumstances of this accident under the provisions of The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996.

In accordance with established international arrangements, the National Transportation Safety Board (NTSB) of the USA, representing the State of Design and Manufacture of the aircraft, has appointed an Accredited Representative to participate fully in the investigation. The NTSB Accredited Representative is supported by a team which includes additional investigators from the NTSB, the Federal Aviation Administration and Boeing; Rolls-Royce, the engine manufacturer, is also participating fully in the investigation. British Airways, the operator, is cooperating with the investigation and providing expertise as required and the CAA and the EASA are being kept informed of developments.

Because of the interest within the aviation industry, and amongst the travelling public, it is considered appropriate to disseminate the results of the initial investigation as soon as possible. This Bulletin is in addition to the Initial Report, published on 18 January 2008, and a subsequent update published on 23 January 2008. As the investigation has developed, additional data has been derived from non-volatile memory within specific systems of the aircraft. This has allowed previously reported data to be refined.

One Safety Recommendation has been made.

History of the flight

The aircraft was on a scheduled flight from Beijing, China, to London (Heathrow) and departed Beijing at 0209 hrs; the flight was uneventful until the later stages of the approach into Heathrow. During the descent, from Flight level (FL) 400 the aircraft entered the hold at Lamborne at FL110; it remained in the hold for approximately five minutes, during which time it descended to FL90. The aircraft was radar vectored for the ILS approach to Runway 27L at Heathrow and subsequently stabilised on the ILS with the autopilot and autothrottles engaged. At 1,000 ft the aircraft was fully configured for the landing, with the landing gear down and flap 30 selected. The total fuel on board was indicating 10,500 kg, which was distributed almost equally between the left and right main fuel tanks, with a minor imbalance of about 300 kg. The fuel cross-feed valves indicated that they were closed and they had not been operated during the flight. The first officer took control for the landing at a height of approximately 780 ft, in accordance with the briefed procedure, and shortly afterwards the autothrottles commanded an increase in thrust from both engines. The engines initially responded but, at a height of about 720 ft, the thrust of the right engine reduced. Some seven seconds later, the thrust reduced on the left engine to a similar level. The engines did not shut down and both engines continued to produce thrust at an engine speed above flight idle, but less than the commanded thrust. The engines failed to respond to further demands for increased thrust from the autothrottles, and subsequent movement of the thrust levers fully forward by the flight crew. The airspeed reduced as the autopilot attempted to maintain the ILS glide slope and by 200 ft the airspeed had reduced to about 108 kt. The autopilot disconnected at approximately 175 ft, the aircraft descended rapidly and its landing gear made contact with the ground some 1,000 ft short of the paved runway surface just inside the airfield boundary fence. During the impact and short

ground roll the nose gear collapsed, the right main landing gear separated from the aircraft and the left main landing gear was pushed up through the wing. The aircraft came to rest on the paved surface in the undershoot area of Runway 27L. A significant amount of fuel leaked from the aircraft after it came to rest, but there was no fire. The cabin crew supervised the emergency evacuation and all occupants left the aircraft via the slides, all of which operated correctly; eight of the passengers received minor injuries and one suffered a broken leg.

Aircraft information

The aircraft was serviceable on departure from Beijing and there were no relevant reported defects. It departed with 79,000 kg of Jet A-1 fuel on board, and the planned arrival fuel at London (Heathrow) was 6,900 kg.

Weather

The recorded weather at Beijing, prior to departure, indicated no significant weather and a surface temperature of -7ºC.

The aircraft's flight plan required it to climb initially to 10,400 m (FL341) before descending back to 9,600 m (FL315) at POLHO (on the border between China and Mongolia) because of 'Extreme Cold'. However, to accommodate a request from ATC the crew accepted a climb to a cruise altitude of 10,600 m (FL348), and closely monitored the fuel temperature. The ambient temperature at FL348 was approximately -65ºC and the associated total air temperature[1] (TAT) was -37ºC. Shortly after crossing the Ural mountains, the aircraft climbed to FL380. There was a region of particularly cold air, with ambient temperatures as low as -76ºC, in the area between the Urals and Eastern Scandinavia. The Met Office described the temperature conditions during the flight as 'unusually low compared to the average, but not exceptional'. The lowest TAT recorded during the flight was -45ºC, and the minimum recorded fuel temperature was -34ºC. The fuel temperature in flight must not reduce to a temperature colder than at least 3ºC above the fuel freezing point of the fuel being used. The specified freezing point for Jet A-1 fuel is -47ºC; analysis of fuel samples taken after the accident showed the fuel onboard the aircraft had an actual freezing point of -57ºC.

On arrival at Heathrow, the surface wind was from 210º at 10 kt, the visibility was greater than 10 km, the cloud was scattered at 800 ft and broken at 1,000 ft, the surface temperature was +10ºC and the dew point was +8ºC. The flight crew reported that they were visual with the runway at about 1,000 ft agl.

Recorded data

The aircraft was fitted with a Digital Flight Data Recorder (DFDR), a Cockpit Voice Recorder (CVR) and a Quick Access Recorder (QAR). The CVR and DFDR were successfully downloaded at the AAIB laboratories at Farnborough and both records covered the critical final stages of the flight. The QAR was downloaded with the assistance of British Airways and the equipment manufacturer. Data from the non-volatile memory of various systems were also available.

The recorded data indicates that there were no anomalies in the major aircraft systems. The autopilot and the autothrottle systems behaved correctly and the engine control systems were providing the correct commands prior to, during, and after, the reduction in thrust.

Engineering examination

The aircraft was recovered from the accident site to a

Footnote

[1] TAT is measured by a specially designed temperature probe, on the surface of the aircraft, that brings the air to rest causing an adiabatic increase in temperature. TAT is higher than static (or ambient) air temperature and is the value to which the fuel temperature will drift.

secure location for detailed examination. There were no indications of any pre-existing problems with any of the aircraft systems.

During the impact the right main landing gear separated from the aircraft rupturing the rear right wall of the centre fuel tank. The two front wheels of the right main landing gear broke away and struck the rear right fuselage penetrating the cabin at seat height adjacent to rows 29/30. Additionally, the right main landing gear damaged the wing-to-body fairing and penetrated the rear cargo hold, causing damage to, and leakage from, the passenger oxygen cylinders.

The engines, their control systems and the fuel system were the focus of a detailed examination.

Engines

Examination of the engines indicated no evidence of a mechanical defect or ingestion of birds or ice.

Data, downloaded from the Electronic Engine Controllers (EECs) and the QAR, revealed no anomalies with the control system operation. At the point when the right engine began to lose thrust the data indicated that the right engine EEC responded correctly to a reduction in fuel flow to the right engine, followed by a similar response from the left EEC when fuel flow to the left engine diminished. Data also revealed that the fuel metering valves on both engines correctly moved to the fully open position to schedule an increase in fuel flow. Both fuel metering units were tested and examined, and revealed no pre-existing defects.

Both engine low pressure fuel filters were clean. The fuel oil heat exchangers (FOHE) in both engines were free of blockage. The right FOHE was clear of any debris, however the left engine FOHE had some small items of debris on its fuel inlet bulkhead. The high pressure filters were clean. The variable stator vane controllers and the fuel burners were examined and found to be satisfactory.

Detailed examination of both the left and right engine high pressure fuel pumps revealed signs of abnormal cavitation on the pressure-side bearings and the outlet ports. This could be indicative of either a restriction in the fuel supply to the pumps or excessive aeration of the fuel. The manufacturer assessed both pumps as still being capable of delivering full fuel flow.

Fuel system

Several fuel samples were taken from the fuel tanks, pipe lines and filter housings prior to the examination of the fuel system and these are currently being examined at specialist laboratories. Initial results confirm that the fuel conforms to Jet A-1 specifications and that there were no signs of contamination or unusual levels of water content. A sump sample taken from the left and right main fuel tanks shortly after the accident revealed no significant quantities of water. Samples from the centre tank had been contaminated by fire fighting foam and hydraulic fluid: this contamination was a consequence of the rupture of the right rear wall of the centre tank.

A detailed examination of the fuel tanks revealed no pre-existing defects except for a loose union in the left main tank at its inner wall; the union formed part of the centre tank to left main tank fuel scavenge line. Some small items of debris were discovered in the following locations:

1. Right main tank – a red plastic sealant scraper approximately 10 cm x 3 cm under the suction inlet screen.

2. Left main tank, water scavenge inlet - a piece of black plastic tape, approximately 5 cm square; a piece of brown paper of the same size and shape, and a piece of yellow plastic.

3. Right centre tank override pump – a small piece of fabric or paper found in the guillotine valve of the pump housing.

4. Left centre tank water scavenge jet pump – small circular disc, 6 mm in diameter, in the motive flow chamber.

The relevance of this debris is still being considered. Examination of the fuel surge tanks showed no signs of blockage of the vent scoops and flame arrestors. Neither pressure relief valve had operated; the relief valves were tested and found to be operate normally.

The fuel boost pumps, and their associated low pressure switches, were tested and examined and found to be satisfactory. A pressure and suction test of the engine fuel feed manifold, from the fuel boost pumps to the engine, did not reveal any significant defects. Similarly, a visual examination of the fuel feed lines, using a boroscope, did not reveal any defects or restrictions. A test of the fuel quantity processor unit (FQPU) was satisfactory and its non-volatile memory did not reveal any defects stored prior to the accident. A test of the fuel temperature probe, located in the left main fuel tank, was satisfactory.

Maintenance

The aircraft's fuel tanks were last checked for water[2] in the fuel on the 15 January 2008 at Heathrow; this was prior to its refuelling for the outboard sector to Beijing.

Access by maintenance personnel, to the aircraft's fuel tanks, had last taken place during maintenance activity in 2005. The last scheduled maintenance activity on the aircraft was on the 13 December 2007.

Spar valves

On examination, both of the engine spar valves were found to be OPEN, allowing the fuel leak evident at the accident site.

The spar valves are designed to shut off the fuel supply to the engines following the operation of the fuel control switches or after operation of the fire handles in the cockpit. Their function is to cut off the fuel flow to the engine in the event of an engine fire or an accident. Each valve has two separate electrical wire paths which can be used to supply power to shut the valve; the first is via a run/cut-off relay, controlled by the fuel control switches, the other is directly from the fire handles.

The wiring on G-YMMM was as originally designed and manufactured, and such that when the fire handle was operated, it isolated the power supply to the run/cut-off relay. When tested, the run/cut-off relays for the left and right engines were still in the valve OPEN position, despite the fuel control switches being set to cut-off. The fire handles had also been pulled and the engine fire bottles had been fired. Therefore the fire handles had been operated prior to the fuel control switches.

The left spar valve circuit breaker (CB) had been tripped. This was due to damaged wiring to the valve as a result of the left main landing gear being forced upward through the conduit at the initial impact. The tripping of the CB meant there was no means of electrically closing the left spar valve. Similar damage was also evident to the right spar valve wiring, however, in this instance the CB had remained set.

Footnote

[2] A check for water in the fuel tank is carried out by draining fuid from the sump drains located at the lowest point of each fuel tank in its 'on-ground' attitude.

Examination and tests of the wiring identified that, in the case of the right engine, the valve CLOSE wire from the run/cut-off relay was still continuous. This could have allowed the valve to operate had the fuel switch been operated before the fire handle.

Boeing had issued a Service Bulletin (SB 777-28-0025) which advised the splicing together of the wires for the fuel control switches and the fire handles to avoid the need to sequence their operation. An FAA airworthiness directive requires this SB to be completed by July 2010. This had not yet been incorporated on G-YMMM; however, had it been incorporated, the right spar valve should have closed when the fuel control switch was operated.

The evacuation checklist for the Boeing 777, issued by Boeing, shows operation of the fuel control switches to cut-off prior to operation of the fire handles. This sequence allows for both CLOSE paths to the spar valve to be exploited and increases the likelihood that the spar valves close before electrical power to the spar valves is isolated. However, if the fire handle is operated first, then only a single path is available.

The operator's evacuation checklist, for which Boeing had raised no technical objection, required the commander to operate the fuel control switches whilst the first officer operated the fire handles, this was in order to reduce the time required to action the checklist. These actions were carried out independently, with no measure in place to ensure the correct sequencing. The evacuation drill was placarded on the face of the control column boss, directly in front of each pilot.

An evacuation checklist with the division of independent tasks between the crew leaves a possibility that the fire handles could be operated before the fuel control switches which, with fire handle to spar valve wire damage, could leave the engine fuel spar shut-off valves in an OPEN position. This occurred in this accident, and resulted in the loss of fuel from the aircraft. This was not causal to the accident but could have had serious consequences in the event of a fire during the evacuation. It is therefore recommended that:

Safety Recommendation 2008-009

Boeing should notify all Boeing 777 operators of the necessity to operate the fuel control switch to cut-off prior to operation of the fire handle, for both the fire drill and the evacuation drill, and ensure that all versions of its checklists, including electronic and placarded versions of the drill, are consistent with this procedure.

Boeing has accepted this recommendation. On 15 February 2008 Boeing issued a Multi Operator Message, which advised operators to ensure that "evacuation and engine fire checklists specify that the fuel control switches are placed in the cut-off position prior to the operation of the fire handles". This advice only relates to those aircraft that have not had Boeing SB 777-28-0025 incorporated. Boeing also recommends that operators review their engine fire and evacuation checklists (Quick Reference Handbook, Electronic and Placard) to make sure that they are consistent with this advice.

Continuing investigation

Investigations are now underway in an attempt to replicate the damage seen to the engine high pressure fuel pumps, and to match this to the data recorded on the accident flight. In addition, comprehensive examination and analysis is to be conducted on the entire aircraft and engine fuel system; including the modelling of fuel flows taking account of the environmental and aerodynamic effects.

Published February 2008

The investigation

In view of the sustained interest within the aviation industry, and amongst the travelling public, it is considered appropriate to publish an update on the continuing investigation into the accident involving a Boeing 777, G-YMMM, which occurred on 17 January 2008. This report is in addition to the Initial Report, published on 18 January 2008, a subsequent update published on 23 January 2008 and a Special Bulletin published on 18 February 2008.

History of the flight

The flight from Beijing to London (Heathrow) was uneventful and the engine operation was normal until the final approach. The aircraft was configured for a landing on Runway 27L and both the autopilot and the autothrottle were engaged. The autothrottles commanded an increase in thrust from both engines and the engines initially responded. However, at a height of about 720 ft the thrust of the right engine reduced to approximately 1.03 EPR (engine pressure ratio); some seven seconds later the thrust on the left engine reduced to approximately 1.02 EPR. The reduction in thrust on both engines was the result of a reduced fuel flow and all engine parameters after the thrust reduction were consistent with this. Parameters recorded on the Quick Access Recorder, Flight Data Recorder and non-volatile memory from the Electronic Engine Controller (EEC) indicate that the engine control system detected the reduced fuel flow and commanded the fuel metering valve to open fully. The fuel metering valve responded to this command and opened fully but with no appreciable change in the fuel flow to either engine.

Engineering examination

Extensive examination of the aircraft and detailed analysis of the recorded data have revealed no evidence of an aircraft or engine control system malfunction. There is no evidence of a wake vortex encounter, a bird strike or core engine icing. There is no evidence of any anomalous behaviour of any of the aircraft or engine systems that suggests electromagnetic interference. The fuel has been tested extensively; it is of good quality, in many respects exceeding the appropriate specification, and shows no evidence of contamination or excessive water. Detailed examination of the fuel system and pipe work has found no unusual deterioration or physical blockages. The spar valves and the aircraft fuel boost pumps were serviceable and operated correctly during the flight. The high pressure (HP) fuel pumps from both engines have unusual and fresh cavitation damage to the outlet ports consistent with operation at low inlet pressure. The evidence to date indicates that both engines had low fuel pressure at the inlet to the HP pump. Restrictions in the fuel system between the aircraft fuel tanks and each of the engine HP pumps, resulting in reduced fuel flows, is suspected.

Environmental conditions

During the flight there was a region of particularly cold air, with ambient temperatures as low as -76ºC, in the area between the Urals and Eastern Scandinavia. The Met Office described the temperature conditions during the flight as 'unusually low compared to the average, but not exceptional'. The lowest total air temperature recorded during the flight was 45ºC, and the minimum recorded fuel temperature was 34ºC. The specified fuel freezing temperature for Jet A-1 is not above -47ºC; analysis of fuel samples taken after the accident showed the fuel onboard the aircraft complied with the Jet A 1 specification and had a measured fuel freezing temperature of -57ºC. The aircraft was operated within its certified flight envelope throughout the flight.

Continuing investigation

The focus of the investigation continues to be the fuel system of both the aircraft and the engines, in order to understand why neither engine responded to the demanded increase in power when all of the engine control functions operated normally. Under the direction of the AAIB, extensive full scale engine testing has been conducted at Rolls-Royce, Derby, and fuel system testing is ongoing at Boeing, Seattle.

The engine test cell at Rolls-Royce was altered to enable the introduction of calibrated restrictions at various locations in the engine and aircraft fuel feed systems to replicate the engine fuel and control system response. The primary challenge at Boeing is to create the environmental conditions experienced on the flight over Siberia, at altitudes up to 40,000 ft, in which to test a representation of the aircraft fuel system. These tests are collectively aimed at understanding and, if possible, replicating the fuel system performance experienced on the day and the potential for formation of restrictions. In addition, work has commenced on developing a more complete understanding of the dynamics of the fuel as it flows from the fuel tank to the engine.

A data analysis team, working with statisticians from QINETIQ, are reviewing and analysing the recorded data from a large sample of flights on similar aircraft. No individual parameter from the flight of G YMMM has been identified to be outside previous operating experience. The analysis is concentrating on identifying abnormal combinations of parameters.

The Federal Aviation Administration, the European Aviation Safety Agency, the Civil Aviation Authority and British Airways are being kept fully briefed on the progress of the investigation.

Operational changes

No operational changes are currently recommended by either the AAIB, Boeing or Rolls-Royce.

Published May 2008