

INCIDENT

Aircraft Type and Registration:	Embraer 190-200, G-FBEH	
No & Type of Engines:	2 General Electric CF34-10E7 turbofan engines	
Year of Manufacture:	2007	
Date & Time (UTC):	15 January 2009 at about 0740 hrs	
Location:	Overhead Edinburgh	
Type of Flight:	Commercial Air Transport (Passenger)	
Persons on Board:	Crew - 5	Passengers - 40
Injuries:	Crew - None	Passengers - None
Nature of Damage:	None	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	40 years	
Commander's Flying Experience:	6,250 hours (of which approximately 100 were on type) Last 90 days - 137 hours Last 28 days - 33 hours	
Information Source:	AAIB Field Investigation	

Synopsis

During flight, "smoke" was seen to emanate from a galley sink and the flight deck and cabin crews took appropriate emergency action. In the course of the *'Electrical System Fire or Smoke'* procedure the flight crew established the aircraft on emergency power, after which communications between the flight deck and cabin became difficult. The aircraft landed safely. Deficiencies in the interphone system were identified, and four Safety Recommendations were made in AAIB Special Bulletin S1/2009 (February 2009).

History of the flight

The aircraft was on a scheduled passenger service from Aberdeen to London Gatwick. As it cruised overhead Edinburgh at FL370, the Senior Cabin Crew Member

(SCCM) poured half a jug of water down the forward galley sink. He saw that "smoke", apparently "ice-blue" in colour, immediately began to emanate from the sink. He assumed that this was not steam, as the jug of water had been drawn from the boiler some minutes previously, and he checked the galley area for signs of fire. He called another cabin crew member to the forward galley, and they both assessed that the "smoke" was not steam. There were no signs of combustion, and neither crew member detected an odour.

The flight deck and cabin crews took appropriate emergency action. In the course of the *'Electrical System Fire or Smoke'* procedure, the flight crew disarmed the emergency lighting, deployed the Ram Air Turbine

(RAT) and then selected off the Integral Drive Generators (IDGs), which are the engine-driven sources of main electrical power. This caused all the cabin lighting to extinguish; it was early morning and there was little ambient light. In the flight deck, only one Primary Flight Display (PFD) and one Multi-Function Display (MFD) remained operating.

The RAT is positioned on the right side of the aircraft nose, forward and below the forward service door; ram air drives a two-bladed ‘propeller’ connected to a generator, supplying emergency electrical power to the aircraft’s systems. The cabin crew heard the noise caused by the RAT’s operation, for which they were unprepared, and which they described as “horrendous”. The cabin lights extinguished soon afterwards.

The SCCM attempted to call the flight crew on the cabin interphone system, by pressing the PILOT call button. The green light above the button (Figure 1) illuminated, but the flight crew did not answer. Despite repeated attempts, using handsets in both the forward and rear galleys, the SCCM could not establish communication with the pilots in this way.

The “smoke” diminished and eventually ceased. Nonetheless, the cabin crew became concerned at the darkness in the cabin, the unexplained noise from the forward part of the aircraft, and the lack of communication with the flight crew. They became concerned either that the flight crew might have become incapacitated or that a serious emergency had developed in the flight deck. After some minutes they decided to attempt to access the flight deck using the emergency flight deck access system¹, but

Footnote

¹ A system which enables the cabin crew to gain access to the flight deck if both flight crew members become simultaneously incapacitated; safeguards prevent its use to gain unauthorised access to the flight deck.

this, too, did not function and the cabin crew were unable to gain access to the flight deck.

Concern amongst the cabin crew continued until the commander made a public address announcement explaining that the aircraft was diverting to Newcastle; the cabin crew then recognised that their concerns were unfounded.

The aircraft landed without further incident and was inspected by the Airport Fire and Rescue Service, who used a thermal imaging camera to search for evidence of heat or fire; none was found.



Figure 1
Cabin interphone handset at front galley

Interphone system

The interphone system includes handsets with illuminated pushbuttons at the forward and aft galleys (Figure 1) and illuminated push-buttons on audio panels in the flight deck (Figure 2). With normal power applied to the aircraft, removing the handset from its cradle and then pressing the PILOT call pushbutton above the handset causes a single chime to sound in the flight deck, and the CAB pushbuttons on the pilots' audio panels illuminate to show an incoming communication. Pressing the pushbutton on either pilot's panel enables voice communications. Pressing the EMER PILOT pushbutton on the handset causes a triple chime to sound in the flight deck, and the EMER pushbuttons on the pilots' audio panels illuminate to show an incoming communication. Pressing the pushbutton on either pilot's panel enables voice communications.

With emergency power (from the RAT and batteries) applied to the aircraft, the EMER system functions normally. However, if a PILOT call is initiated from either handset in the cabin, the green light above the pushbutton illuminates and a single chime is heard in the flight deck, but the pushbuttons on the pilots' audio panels do not illuminate, and voice communication cannot be established.

The flight deck access system

On emergency power, the normal flight deck access system does not function. Access to the flight deck in this condition relies upon action within the flight deck.

Engineering investigation

The initiating factor in this incident was the "smoke" emanating from the forward galley sink. The forward galley was inspected and no signs of fire or smoke were found. Samples of fluid and scale-like deposits from



Figure 2

Pilot's audio panel in flight deck

the boiler and the boiler drip tray were subsequently chemically analysed and were found to be consistent with normal operation using water. The boiler was taken to the manufacture for a functional test and a strip inspection: nothing significant was found.

It was not possible to provide a satisfactory explanation for the "blue smoke". However, the "ice-blue" light above the sink was probably significant in leading the SSCM to believe that the "blue smoke" was potentially dangerous.

Interphone tests

Tests on the interphone system on another Embraer 190-200 aircraft showed similar functioning of the interphone system to that in G-FBEH.

Operational investigation and analysis

Whilst the "smoke" was the initiating factor in this incident, it was the performance of some of the aircraft's systems whilst the aircraft was on emergency power which caused serious concern amongst the crew.

The PILOT function of the interphone system seemed, to the cabin crew, to indicate that it was functioning normally. However, the CAB pushbutton in the flight deck did not

illuminate, and no voice contact was possible. The cabin crew did not attempt to use the EMER PILOT function, as this would involve an emergency call, which differed (in the cabin crewmembers' perception) from the normal call only in the number of chimes.

The 'false positive' indication of the PILOT call was crucial to the incident; had the PILOT call not appeared to function correctly, it is probable that the cabin crew, instead of contemplating incapacitation of the flight crew or serious emergency on the flight deck, would have attempted to establish communication using the EMER PILOT call.

The operator's operations manual did not detail the functioning of the interphone and flight deck access systems when the aircraft was on emergency power, and training had not made the crew aware of this functioning.

Safety Recommendations and action

The following Safety Recommendations were made in AAIB Special Bulletin S1/2009:

Safety Recommendation 2009-017

It is recommended that Embraer (Empresa Brasileira de Aeronautica SA) immediately notify all operators, of the Embraer 190 family of aircraft, to inform flight crew of the importance of advising cabin crew when an aircraft is on emergency electrical power.

Safety Recommendation 2009-018

It is recommended that Embraer (Empresa Brasileira de Aeronautica SA) immediately notify all operators, of the Embraer 190 family of aircraft, to inform their flight and cabin crew

of the functioning of the interphone system when the aircraft is supplied only with emergency electrical power.

Safety Recommendation 2009-019

It is recommended that Embraer (Empresa Brasileira de Aeronautica SA) modify the functioning of the interphone systems of Embraer 190 family aircraft to provide crew with the facility to make both normal and emergency calls when the aircraft is supplied only with emergency electrical power.

Safety Recommendation 2009-020

It is recommended that Embraer (Empresa Brasileira de Aeronautica SA) immediately notify all operators, of the Embraer 190 family of aircraft, to inform flight and cabin crew of the functioning of the flight deck access system when the aircraft is supplied only with emergency electrical power.

Manufacturer's response

In response, Embraer has agreed with Safety Recommendations 2009-018 and 2009-020 and pertinent information is included in recent revisions of the Airplane Operations Manual (AOM) and Flight Attendant Manual (FAM) for affected Embraer 170 and 190 operators.

For Safety Recommendations 2009-017, it is Embraer's opinion that it would not be advisable to increase the flight crew workload in an electrical emergency situation and that this issue is more properly addressed through the FAM and training.

Safety Recommendation 2009-019 is under analysis by Embraer engineering.