AIRCRAFT ACCIDENT REPORT No 4/2009

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REPORT ON THE SERIOUS INCIDENT TO AIRBUS A319-111, REGISTRATION G-EZAC NEAR NANTES, FRANCE ON 15 SEPTEMBER 2006

Registered Owner and Operator:	EasyJet Airline Company Limited
Aircraft Type and Model:	Airbus A319-111
Registration:	G-EZAC
Manufacturer's Serial Number	2691
Place of Incident:	Near Nantes, France at FL320
Date and Time:	15 September 2006 at 1052 hrs. (All times in this report are UTC, unless otherwise stated)

Synopsis

The serious incident occurred to an Airbus A319-111 aircraft operating a scheduled passenger flight between Alicante, Spain and Bristol, UK. The aircraft had experienced a fault affecting the No 1 (left) electrical generator on the previous flight and was dispatched on the incident flight with this generator selected off and the Auxiliary Power Unit generator supplying power to the left electrical network.

While in the cruise at Flight Level (FL) 320 in day Visual Meteorological Conditions (VMC), with the autopilot and autothrust systems engaged, a failure of the electrical system occurred which caused numerous aircraft systems to become degraded or inoperative. Some of the more significant effects were that the aircraft could only be flown manually, all the aircraft's radios became inoperative and the Captain's electronic flight instrument displays blanked.

Attempts by the flight crew to reconfigure the electrical system proved ineffective and the aircraft systems remained in a significantly degraded condition for the remainder of the flight, making operation of the aircraft considerably more difficult. The flight crew were unable to contact air traffic control for the rest of the flight. The aircraft landed uneventfully at Bristol, with the radios and several other systems still inoperative.

The incident was reported to the Air Accidents Investigation Branch (AAIB) by the operator at 1452 hrs local on 15 September 2006. An investigation was commenced shortly thereafter. France, as the state of aircraft manufacture and design, appointed an Accredited Representative from the BEA[1]. Assistance was also given by the aircraft manufacturer, Airbus.

Footnote

[1] Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile, the French equivalent of the AAIB.

The reasons why the electrical system could not be reconfigured by the flight crew could not be established.

The investigation identified the following causal factors in this incident:

1. An intermittent fault in the No 1 Generator Control Unit, which caused the loss of the left electrical network

2. An aircraft electrical system design which required manual reconfiguration of the electrical feed to the AC Essential busbar in the event of de-energisation of the No 1 AC busbar, leading to the loss or degradation of multiple aircraft systems, until the electrical system is reconfigured

3. The inability of the flight crew to reconfigure the electrical system, for reasons which could not be established

4. Master Minimum Equipment List provisions which allowed dispatch with a main generator inoperative without consideration of any previous history of electrical system faults on the aircraft

5. Inadequate measures for identifying Generator Control Units repeatedly rejected from service due to repetition of the same intermittent fault

Preliminary information on the progress of the investigation was published in AAIB Special Bulletin S9/2006 on 13 December 2006 and four Safety Recommendations were made. Ten additional Safety Recommendations are made in this report.

Findings

1. The flight crew involved in the incident were licensed and qualified to operate the flight and were in compliance with the applicable flight time and duty time limitations.

2. The aircraft held a valid Certificate of Airworthiness and was maintained in accordance with an EASA-approved maintenance programme.

3. A reset of the No 1 generator control unit during maintenance carried out prior to despatch of the aircraft from London Stansted was technically incorrect but in accordance with common general practice.

4. The No 1 engine-driven generator tripped off-line on the flight sector between Stansted and Alicante and would not reset.

5. The aircraft was despatched from Alicante on the incident flight with the APU generator substituting for the No 1 generator, in accordance with the operator's MEL, which reflected the manufacturer's MMEL.

6. The MMEL did not require the reason for the No 1 generator trip to be investigated prior to dispatch.

7. The Operational Procedure in the MMEL did not contain the associated procedure for a check of the APU fuel pump.

8. While in the cruise at FL 320 in VMC, the aircraft suffered severe disruption of the electrical power system, causing multiple

aircraft systems either to cease operating or to become degraded, significantly increasing the flight crew's workload.

9. All means of radio communications became inoperative and remained so because they all relied on a single busbar which de-energised and was unavailable for the remainder of the flight.

10. The loss of all means of radio communications caused the crew considerable concern and delayed their continuation of the ECAM actions.

11. G-EZAC's transponder signal was lost for about 10 minutes, during which time the aircraft was not visible to Brest ATCC radar, leading to reduced separation with another aircraft.

12. The loss of power supply to the ATC 1 transponder rendered the TCAS inoperative until the ATC 2 transponder was selected some 10 minutes later.

13. Despite the pilots' attempts to follow the ECAM action messages, many of the affected aircraft systems were not recovered.

14. The flight crew reported that no captions were visible in the AC ESS FEED push-button selector switch and that operation of the switch failed to reconfigure the power supply with the result that power to the left electrical network could not be restored in flight. During subsequent testing on the ground, the system was found to operate normally.

15. The flight crew could not determine the settings of certain flight deck push-button selectors as the button position did not change significantly with selection and the caption lights were not visible.

16. The CVR ceased to operate following the loss of the AC ESS SHED busbar.

17. The FDR did not record any switching of the AC BUS 2-to-AC ESS contactor throughout the flight.

18. The potential effect of loss of all three VHF radios was categorised by the airworthiness authorities as 'Major' but, in the current security climate, was judged to be more severe.

19. An intermittent fault was found in an electronic component of the No 1 generator control unit (GCU 1) which probably caused the No 1 generator trip on the outbound flight.

20. Recurrence of the GCU 1 fault during the incident flight probably caused the de-energisation of AC BUS 1 and the consequent severe electrical system disruption.

21. The GCU 1 had repeatedly been rejected from service prior to the incident, possibly because of recurrence of the same intermittent fault, and returned to service without the fault having been found, but still present.

22. No effective system aimed at identifying units repeatedly rejected from service and not found to be faulty, or units suffering repetitive faults, was in place at the GCU manufacturer's repair organisation.

Causal factors

The investigation identified the following causal factors in this incident:

1. An intermittent fault in the No 1 Generator Control Unit, which caused the loss of the left electrical network

2. An aircraft electrical system design which required manual reconfiguration of the electrical feed to the AC Essential busbar in the event of de-energisation of the No 1 AC busbar, leading to the loss or degradation of multiple aircraft systems, until the electrical system is reconfigured

3. The inability of the flight crew to reconfigure the electrical system, for reasons which could not be established

4. Master Minimum Equipment List provisions which allowed dispatch with a main generator inoperative without consideration of any previous history of electrical system faults on the aircraft

5. Inadequate measures for identifying Generator Control Units repeatedly rejected from service due to repetition of the same intermittent fault

Safety Recommendations

Four Safety Recommendations were made in AAIB Special Bulletin S9/2006, published 13 December 2006, as follows:

Safety Recommendation 2006-142

It is recommended that Airbus should revise, for the A320 aircraft series, the fault monitoring logic of the Generator Control Unit to prevent the monitoring system from incorrectly interpreting a fault within the GCU as an external system fault.

Safety Recommendation 2006-143

It is recommended that Airbus should introduce, for Airbus A320-series aircraft, a modification to automatically transfer the electrical feed to the AC Essential busbar in the event of the loss of the No 1 Main AC busbar.

Safety Recommendation 2006-144

It is recommended that Airbus should advise all operators of A320 series aircraft with Radio Telephony (RTF) communications reliant upon a single busbar of the consequent possibility of loss of all RTF communications.

Safety Recommendation 2006-145

It is recommended that, for A320 series aircraft with digital Audio Management Units, Airbus should take modification action aimed at ensuring that electrical power supplies required for Radio Telephony communications have an improved level of segregation.

This report makes 10 further Safety Recommendations:

Safety Recommendation 2008-81

It is recommended that the EASA require modification of Airbus A320-series aircraft to provide automatic changeover of the electrical power feed to the AC Essential busbar in the event of de-energisation of the AC BUS 1 busbar.

Safety Recommendation 2008-83

It is recommended that the EASA and the FAA introduce certification requirements aimed at ensuring that flight deck control selectors are designed such that an immediate and unmistakable indication of the selected position is always provided to the flight crew.

Safety Recommendation 2008-84

It is recommended that the EASA requires the modification of affected Airbus A320-series aircraft so that the loss of a single busbar does not result in the complete loss of Radio Telephony communications.

Safety Recommendation 2008-85

It is recommended that the EASA and the FAA re-categorise the loss of all Radio Telephony communications for public transport aircraft as 'Hazardous'.

Safety Recommendation 2008-86

It is recommended that the EASA require Airbus to review the A320-series Master Minimum Equipment List (MMEL) for the validity of dispatch with an IDG inoperative, given that an intermittent fault in a Generator Control Unit can result in significant disruption of aircraft systems.

Safety Recommendation 2008-87

It is recommended that the EASA require Airbus to revise the A320-series Master Minimum Equipment List to include a requirement to check for correct operation of the manual AC ESS FEED changeover function prior to dispatch with a main generator inoperative.

Safety Recommendation 2008-88

It is recommended that Hamilton Sundstrand modifies its repair and overhaul procedures to ensure that a unit with an excessive service rejection rate or a recurrent fault is not repeatedly released back to service.

Safety Recommendation 2008-89

It is recommended that the EASA and the FAA require that approved component repair organisations have procedures in place to identify units with an excessive service rejection rate or recurrent faults.

Safety Recommendation 2008-90

It is recommended that the EASA require improvements to the fault monitoring logic of the type of Generator Control Unit (GCU) used on A320-series aircraft with the aim of preventing the monitoring system from incorrectly interpreting a fault within the GCU as an external system fault.

Safety Recommendation 2009-063

It is recommended that the EASA extend the guidance material provided for the EASA 25-1309 certification standard for failure effect analyses, to include consideration of the effects of delayed or non-achieved crew actions, in addition to crew errors.