
Instrument failure, Airbus A319-131, G-EUOB

Micro-summary: After a CLUNK and the failure of a number of systems, the crew declared an emergency.

Event Date: 2005-10-22 at 1926 UTC

Investigative Body: Aircraft Accident Investigation Board (AAIB), United Kingdom

Investigative Body's Web Site: <http://www.aaib.dft.gov/uk/>

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Department for Transport

AAIB Bulletin S3/2006

SPECIAL

INCIDENT

Aircraft Type and Registration:	Airbus A319-131, G-EUOB
Manufacturer's Serial Number:	1529
No & Type of Engines:	2 IAE V2522-A5 turbofan engines
Year of Manufacture:	2001
Date & Time (UTC):	22 October 2005 at 1926 hrs
Location:	Near Clacton, Essex
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 76
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	11,800 hours (of which 4,000 were on type) Last 90 days - 180 hours Last 28 days - 70 hours
Information Source:	AAIB Field Investigation

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Introduction

This event was initially reported in AAIB Special Bulletin S2/2005, published on 25 November 2005. The AAIB has become aware of five previous incidents involving reported failures which have resulted in the loss of both the commander's and co-pilot's primary flight and navigation displays (PFD and ND) and the ECAM (Electronic Aircraft Centralised Monitor) upper display. The reason for the loss of the co-pilot's displays has not been fully explained in any of these cases.

This second Special Bulletin is issued to provide further information and to transmit Safety Recommendations.

Summary of the event

The aircraft departed London Heathrow at 1918 hrs on a scheduled flight to Budapest. At 1926 hrs, as it approached FL200 in dark but clear weather conditions, the crew reported that there was an audible 'CLUNK' and the flight deck became dark with a number of systems and flight information displays being lost. The crew reported the following symptoms:

- Loss of both the commander's and the co-pilot's primary flight and navigation displays and the ECAM upper display, leaving only the ECAM lower display available,
- Loss of the autopilot, with an associated aural Master Warning tone,
- Loss of autothrust, with an associated aural Master Caution tone,
- Loss of intercom,
- Loss of most flight deck lighting including all integral lights on the glareshield, overhead and pedestal panels.

The commander, who was in the left seat and the Pilot Flying (PF), took manual control and maintained the aircraft attitude by reference to the external night horizon and the standby horizon. There was a low level of ambient light in the flight deck, and although the standby instruments for attitude, altitude and airspeed reference were operating, they were not lit. The commander attempted to transmit a 'MAYDAY' call on VHF No 1, however this was not received by Air Traffic Control because the radio was no longer powered. The ECAM actions displayed on the lower ECAM screen were carried out by the co-pilot. The investigation has established that the primary flight instruments and most of the affected systems were restored after about ninety seconds, following selection of the AC ESS FEED push button switch to ALTN, in accordance with the ECAM procedure.

ECAM procedures for failure management

The ECAM upper display or Engine/Warning Display (E/WD) primarily displays engine data and ECAM warning messages and memos. Following an aircraft systems failure, warning messages and any associated actions to be taken by the crew will normally be displayed on the lower part of the ECAM upper display. The ECAM lower display or System Display (SD) normally displays aircraft systems status information. In addition, synoptics of various aircraft systems may be called up by the crew, or may appear automatically on the ECAM lower display following aircraft systems failures.

If the ECAM upper display fails, the information normally presented on it is automatically transferred onto the ECAM lower display, replacing the system/status information.

The lower part of either ECAM screen can only display a limited number of lines of text. In the event of a system

failure, each ECAM warning message/memo item must be read, actioned if required and then cleared by pressing the CLR button on the ECAM control panel. As items are cleared, the list scrolls upwards on the screen and further messages appear, until the end of the list is reached.

It is believed that the items displayed on the first 'page' of the ECAM lower display following the incident would have been as follows:

AUTOFLIGHT AP OFF
ENG 1 EPR MODE FAULT
 - ENG 1 N1 MODE.....ON
 - ENG 2 N1 MODE.....ON
 - MAN THRUST.....ADJUST
ENG 2 EIU FAULT
ENG 1 AC FADEC SUPPLY

The action which restored most of the affected systems, including the flight instruments was:

ELEC AC ESS BUS FAULT
 - AC ESS FEED.....ALTN

This ECAM action was the ninth or tenth item on the list and was not initially visible; it would only have appeared on the ECAM lower display after some of the preceding actions had been cleared. The co-pilot was further hampered in carrying out the ECAM actions by the lack of lighting on the panels and this resulted in the AC ESS FEED push button switch not being selected to ALTN until about 90 seconds after the initial failure.

The loss of both the commander and co-pilots' PFDs and NDs, at a critical phase of flight in instrument conditions, could affect the safe operation of the aircraft and such a long delay in recovering the displays is therefore undesirable. The following safety recommendation is therefore made:

Safety Recommendation 2006-051

It is recommended that the aircraft manufacturer, Airbus, reviews the existing ECAM actions for the A320 series aircraft, given the possibility of the simultaneous in-flight loss of the commander's and co-pilots' primary flight and navigation displays. They should consider whether the priority of the items displayed on the ECAM should be altered, to enable the displays to be recovered as quickly as possible and subsequently issue operators with a revised procedure if necessary.

Minimum Equipment List

The Master Minimum Equipment List (MMEL) produced by the manufacturer, the basis on which the operator's MEL is compiled, allows aircraft to be operated for limited periods of time with certain items of equipment inoperative. The MMEL for the Airbus A318/319/320/321 (A320 series) aircraft, Chapter 31, INDICATING/RECORDING SYSTEMS, states that of the six display units, five, which must include the ECAM upper display unit, must be serviceable. A display unit is a Category 'C' item, which must be repaired within ten consecutive days.

It is therefore possible for an aircraft to be dispatched with the ECAM lower display inoperative. On this occasion, the ECAM lower display was the only one left available. Without this there would not have been any information readily available to the crew as to how to manage the failure and restore the affected systems. The following safety recommendation is therefore made:

Safety Recommendation 2006-052

It is recommended that the aircraft manufacturer, Airbus, should review the A320 series aircraft Master Minimum Equipment List Chapter 31, INDICATING/RECORDING SYSTEMS and reconsider whether it is acceptable to allow the ECAM lower display unit to be unserviceable. They should amend the requirement, as necessary, to take account of the possibility of the simultaneous in-flight loss of both the commander's and co-pilot's primary flight and navigation displays and the ECAM upper display.

Standby flight instrument power source

There are two configurations for the power supply to the standby artificial horizon on Airbus A320 series aircraft. In the first, the standby horizon only receives power from the 28v DC Essential Bus. As the 28v DC Essential Bus is normally supplied by AC Bus 1, if AC Bus 1 should fail, the standby horizon will no longer be powered, although it will remain useable for 5 minutes. This is a matter for concern on the affected aircraft and the implications of this on aircraft certification should be reviewed. The second configuration, introduced by Airbus Modification No 28658 and embodied on G-EUOB, incorporates the wiring for the Integrated Standby Instruments System (ISIS) and provides a dual power supply to the standby horizon. In this case, if the normal 28v DC Essential power supply to the standby artificial horizon is lost, it will be supplied with power from the 28v DC Hot Bus, provided the airspeed is above 50 kt, and will therefore continue to operate in flight.

The following safety recommendation is therefore made:

Safety Recommendation 2006-053

The aircraft manufacturer, Airbus, should identify those aircraft with the single power supply to the standby artificial horizon and advise the operators of the potential implications of this configuration.

In Special Bulletin S2/2005 it was reported that the standby artificial horizon on G-EUOB would not have remained powered. This statement was based on information contained in the Flight Crew Operating Manual (FCOM) for G-EUOB, which implied that the standby horizon had the single power supply configuration. It was subsequently established that this aircraft had the ISIS wiring provision and so its standby horizon remained powered, but would not have been lit.

The following safety recommendation is therefore made:

Safety Recommendation 2006-054

It is recommended that the aircraft manufacturer, Airbus, revises the information about the power sources for the standby artificial horizon provided in Flight Crew Operating Manuals for the A320 series aircraft to reflect the actual status of the aircraft to which they apply.

The AAIB is continuing to investigate this incident with the cooperation of the aircraft manufacturer and the operator. A final report will be published when the investigation is complete.

Department for Transport

AAIB Bulletin S2/2005

SPECIAL

INCIDENT

Aircraft Type and Registration:	Airbus A319-131, G-EUOB
No & Type of Engines:	2 V2522-A5 turbofan engines
Category:	1.1
Year of Manufacture:	2001
Date & Time (UTC):	22 October 2005 at 1926 hrs
Location:	Near Clacton, Essex
Type of Flight:	Public Transport (Passenger)
Persons on Board:	Crew - 6 Passengers - 76
Injuries:	Crew - None Passengers - None
Nature of Damage:	None
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	53 years
Commander's Flying Experience:	11,800 hours (of which 4,000 were on type) Last 90 days - 180 hours Last 28 days - 70 hours
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History of flight

The aircraft departed London Heathrow at 1918 hrs on a scheduled flight to Budapest. At 1926 hrs, as it approached FL200 in clear weather conditions, the crew reported that there was an audible 'CLUNK' and the flight deck became dark with a number of electrical systems and flight information displays were lost. The crew reported the following symptoms:

- *Loss of the Captain's and the First Officer's Primary Flight Displays, Navigation Displays and the Upper ECAM¹ display, leaving only the lower ECAM display available*
- *Loss of the Autopilot, with an associated aural Master Warning tone*
- *Loss of Autothrust, with an associated aural Master Caution tone*
- *Loss of intercom*
- *Loss of most flight deck lighting including all integral lights on glareshield, overhead and pedestal panels.*

The commander, who was the Pilot Flying (PF), took manual control and maintained the aircraft attitude by reference to the external night horizon, the standby horizon and those other standby instruments that he was able to see. (It is probable that the electrically driven standby horizon was not powered or lighted, however according to the flight manual it does remain useable for 5 minutes.) The commander transmitted a 'MAYDAY' call on VHF No 1, however this was not received by Air Traffic Control because the radio was no longer powered. The First Officer carried out the ECAM actions. The primary flight instruments and most other systems were restored after

selection of the 'AC ESS FEED' push button switch, in accordance with the ECAM procedure. The aircraft was in the degraded condition for a period of about two minutes.

Communication with ATC was regained and the crew requested, and were allocated, a holding pattern while they reviewed the status of the aircraft. The crew reported that, following completion of the ECAM actions, a number of systems remained inoperative including the No 1 Transformer Rectifier unit and the Captain's windshield and window heat. The aircraft was in the hold for some 40 minutes following which the flight was continued to Budapest where the First Officer performed the landing. During the landing roll the flight crew noted a No 1 thrust reverser amber caution.

After landing all the remaining affected systems were successfully reset by a maintenance engineer and the aircraft continued in operation for six days with no further electrical failures reported.

Subsequent action

The circumstances of this incident came to the attention of the AAIB through the UK Mandatory Occurrence Reporting (MOR) Scheme. The aircraft was then taken out of service for investigation under AAIB supervision. Troubleshooting actions included integrity checks of the electrical power system and inspection of the Integrated Drive Generator feeder connectors located in the engine pylons. These tests did not reveal any anomalies.

The No 1 Generator Control Unit and a number of other components were removed for investigation, including all three Display Management Computers, the No 2 System Data Acquisition Concentrator unit and the No 2 Flight Warning Computer. The aircraft was returned to service and has continued in operation without any further reports of similar malfunctions.

Footnote

¹ Electronic Centralized Aircraft Monitor

Summary

The flight crew lost all of the primary flight instrument displays and used both the visual and standby horizons for attitude reference. The standby horizon, which was unpowered, would only have been available for

5 minutes. The AAIB is investigating this incident with the cooperation of the aircraft manufacturer and the operator. A further report will be published when the investigation is complete.