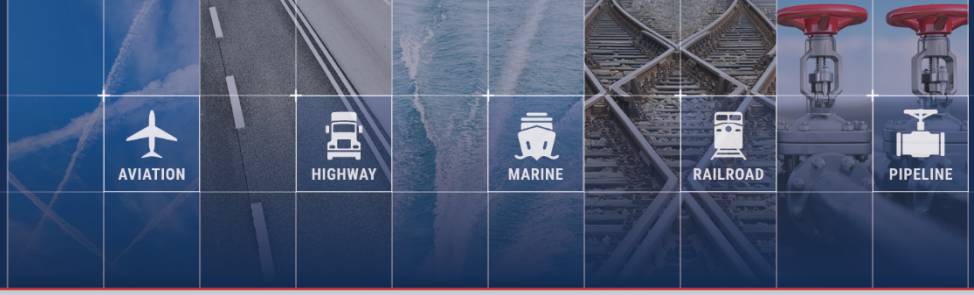

Aviation Investigation Factual Report

Location:	Newark, New Jersey	**Incident Number:**	DCA08IA033
Date & Time:	January 25, 2008, 09:45 Local	**Registration:**	N462UA
Aircraft:	Airbus A320	**Aircraft Damage:**	None
Defining Event:	Electrical system malf/failure	**Injuries:**	107 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Factual Information

HISTORY OF FLIGHT

On January 25, 2008, about 0945, an Airbus A320, N462UA, operated by United Airlines as flight 731, returned to Newark Liberty International Airport (EWR), Newark, New Jersey, shortly after departure from runway 22R because three of the six electronic displays providing information to the flight crew went blank and several aircraft systems became inoperative. The flight crew landed the airplane without further incident, and no injuries were reported for anyone on board the flight. Visual meteorological conditions (VMC) prevailed at the time of the incident for the 14 Code of Federal Regulations Part 121 scheduled domestic flight, which was operating on an instrument flight rules flight plan.

According to the flight crew, shortly after takeoff, the captain's primary flight display (PFD) and navigational display (ND), along with the upper electronic centralized aircraft monitoring (ECAM) display, went blank. The ND for the first officer remained functional, as did the lower ECAM display; however, the first officer reported that the attitude information on his PFD was initially not usable but that the information appeared to be reliable later in the flight. In addition, although the handle that controls the landing gear had been moved to the retract position after takeoff, the landing gear did not retract. According to the crew, all radios were inoperative and the overhead panel was blank. The pilots leveled the aircraft at their first assigned altitude of 2,500 feet, elected to return to the field, and landed at EWR with several aircraft systems inoperative, including the airplane's transponder, the traffic alert and collision avoidance system, and the standby attitude indicator. The crew later reported that the indicator (which, according to Airbus, is designed to function for about 5 minutes after it loses power) stopped functioning while the aircraft was on the downwind leg of the approach for landing.

After landing, the flight crewmembers observed that the "AC ESS FEED" pushbutton on the overhead panel had an illuminated fault indication for the AC 1 electrical bus. Both crewmembers stated that this fault indication was not illuminated in flight. They then manually selected the AC essential electrical bus feed to "alternate," which reconfigured the power supply. After this selection, the captain's instruments, as well as most of the failed aircraft systems resumed functioning.

PERSONNEL INFORMATION

The captain was 54 years old and held an airline transport pilot certificate with an Airbus A320 type rating. He held a first-class medical certificate dated December 12, 2007, with no limitations. Records indicated he had about 14,500 hours total time with about 4,950 hours in the A320.

The first officer was 40 years old and held an airline transport pilot certificate with an Airbus A320 type rating (second in command). He held a first-class medical certificate dated March 10, 2007, with no limitations. Records indicated he had about 5,000 hours total time with about 2,290 hours in the A320.

AIRCRAFT INFORMATION

The flight instruments in an Airbus A320 include the captain's primary flight display (PFD) and navigational display (ND), the first officer's PFD and ND, and the upper and lower electronic centralized aircraft monitoring (ECAM) displays. The ECAM system automatically displays messages and system diagrams to pilots. It provides operational assistance for both normal and abnormal airplane operational situations.

The primary sources of electrical power for the A320, AC 1 and AC 2 use several electrical busses to distribute power throughout the airplane. In its normal configuration, the AC 1 electrical bus provides power to the AC essential bus, the DC essential bus, and DC 1 bus (power is provided to the DC electrical busses after first passing through a transformer-rectifier unit.) The auxiliary power unit and air driven emergency generator can also provide limited aircraft electrical power under some conditions. When a fault is detected in the AC 1 electrical bus (or it stops providing power), the other busses can be powered by an alternate configuration, which entails selecting the AC 2 electrical bus to provide power. The alternate reconfiguration of the electrical system must be performed manually by the flight crew and is accomplished by activating a pushbutton switch located on the overhead panel.

TESTS AND RESEARCH

Following the incident, maintenance personnel examined the #1 integrated drive generator (IDG) pylon connector for signs of arcing and #1 engine feeder cables. No defects were noted. The #1 IDG, bus tie contactor (BTC), and generator control unit (GCU) were removed for testing and examination.

The IDG and GCU were examined at the Hamilton Sundstrand facilities in Rockford, Illinois. Both units were placed on the systems test bench and subjected to loading conditions representative of the conditions that existed at the time of the incident. Both units completed the test series with no faults found. In addition, a production acceptance test procedure was conducted on the IDG with no faults found. Finally, the IDG was partially disassembled for a detailed examination and no problems with the unit were noted.

The BTC was tested and examined at a United Airlines maintenance facility and was found to be in good physical condition. The BTC was then tested per OEM procedures and passed all requirements. The unit was then partially disassembled and inspected with no defects noted.

PREVIOUS INCIDENTS

On October 22, 2005, a British Airways A319 flight from London Heathrow Airport to Budapest, Hungary, had a similar event occur. As the airplane climbed through 20,000 feet in night VMC with the autopilot and autothrust engaged, an electrical failure occurred, which resulted in five out of the six flight displays going blank. In addition, the autopilot and autothrust systems disconnected, the VHF radio and intercom became inoperative, and most of the cockpit lighting went off. After troubleshooting the problem, the flight crew was able to restore power to the displays and most of the affected systems by manually selecting the AC essential electrical bus feed to "alternate," which reconfigured the electrical system to provide power from the AC 2 electrical bus. The United Kingdom Air Accidents Investigation Branch (AAIB) investigated this incident. No definitive cause for the AC 1 bus fault could be determined.

According to Airbus, as of May 2007, 49 events similar to the United Airlines flight 731 and UK events had occurred in which the failure of electrical busses resulted in the loss of flight displays and various aircraft systems. Of these 49 events, roughly 37 were due to failures of the AC 1 bus.

SAFETY ACTIONS TAKEN

In response to the previous incidents, Airbus issued two service bulletins:

- Service Bulletin SB A320-24-1120 was issued on May 31, 2007. This service bulletin provided for the automatic reconfiguration of the AC essential bus power supply in the event that the AC 1 electrical bus fails. Along with this service bulletin, Airbus released a Retrofit Information Letter (SEOT2/916.0083/08, revision 1, dated 28 January 2008). This letter stated that the modification kits required to accomplish SB A320-23-1120 were available from Airbus free of charge.

- Service Bulletin SB A320-33-1057 was issued on May 11, 2007. This service bulletin provided for the modification of the supply logic for the standby horizon and the cockpit floodlight located under the glareshield so that they are supplied by the hot electrical bus. This is designed to ensure that the standby horizon remains powered and illuminated in the event that the AC 1 electrical bus fails.

In response to the circumstances of this incident, on July 22, 2008, the National Transportation Safety Board issued Safety Recommendations A-08-53 through -55 to the Federal Aviation Administration (FAA) and Safety Recommendations A-08-56 through 58 to the European Aviation Safety Agency (EASA). All recommendations have been closed-acceptable action, closed-acceptable alternate action, closed-reconsidered, or closed-no longer applicable.

The FAA issued the following Airworthiness Directives and Alerts as a result of this incident and the previous incidents:

- Airworthiness Directive 2009-01-04, on February 27, 2009, which requires operators of in-service A320 family aircraft that are equipped with a classic standby instrument system to incorporate the recommended modifications. Upon completion, modified airplanes were equipped with an electronically driven mechanical attitude indicator powered by an additional source that will last for a minimum of 30 minutes in the event of an AC 1 electrical bus failure.

- Airworthiness Directive 2010-10-08, on June 21, 2010, which requires operators of in-service A320 family aircraft to incorporate the modifications specified in Airbus Service Bulletin A320-24-1120.

- Safety Alert for Operators (SAFO) 08020, "The Loss of Flight Displays and Aircraft Systems Following Partial Electrical Power Failure on Airbus A318 Through A321 Series Airplanes," which was published on October 8, 2008. This SAFO emphasizes the necessity for operators to provide flight crews with guidance and appropriate training (1) to quickly recognize the symptoms of an AC 1 electrical bus failure and (2) to respond appropriately.

The EASA issued the following Airworthiness Directives as a result of this incident and the previous incidents:

- Airworthiness Directive 2009-0235, on October 29, 2009, which requires the modification of the electrical power distribution system on the A320 family of aircraft, in accordance with Airbus Service Bulletin A320-24-1120.

Pilot Information

Certificate:	Airline transport; Flight engineer; Flight instructor	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	December 12, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	August 28, 2007
Flight Time:	14500 hours (Total, all aircraft), 4950 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Airline transport; Commercial	**Age:**	40,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	March 10, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	5000 hours (Total, all aircraft), 2290 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Airbus	**Registration:**	N462UA
Model/Series:	A320 232	**Aircraft Category:**	Airplane
Year of Manufacture:	2000	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	1272
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	169756 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	27021 Hrs	**Engine Manufacturer:**	Iae
ELT:	Installed, not activated	**Engine Model/Series:**	V2500SERIES
Registered Owner:	United Airlines Inc	**Rated Power:**	9895 Horsepower
Operator:	United Airlines Inc	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	UALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 4700 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 5500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 16 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	-3°C / -11°C
Precipitation and Obscuration:			
Departure Point:	NEWARK, NJ (EWR)	**Type of Flight Plan Filed:**	IFR
Destination:	DENVER, CO (DEN)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class B

Airport Information

Airport:	Newark Liberty Intl EWR	**Runway Surface Type:**	
Airport Elevation:	17 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	5 None	**Aircraft Damage:**	None
Passenger Injuries:	102 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	107 None	**Latitude, Longitude:**	40.689723,-74.174446(est)

Administrative Information

Investigator In Charge (IIC):	Sedor, Joseph
Additional Participating Persons:	Tony James
Report Date:	July 11, 2024
Last Revision Date:	July 11, 2024
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=67436