
Cargo compartment fire on ground, McDonnell Douglas MD-11, November 8, 1998

Micro-summary: This MD-11 experienced a fire in the center cargo compartment while at the gate.


Event Date: 1998-11-08 at 2100 EST


Investigative Body: National Transportation Safety Board (NTSB), USA

Investigative Body's Web Site: <http://www.nts.gov/>

Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
 2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
 3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.
 4. Contact us before reproducing or redistributing a report from this anthology. Individual countries have very differing views on copyright! We can advise you on the steps to follow.
-

 National Transportation Safety Board FACTUAL REPORT AVIATION		NTSB ID: ATL99IA015		Aircraft Registration Number: N811DE	
		Occurrence Date: 11/08/1998		Most Critical Injury: None	
		Occurrence Type: Incident		Investigated By: NTSB	
Location/Time					
Nearest City/Place ATLANTA		State GA	Zip Code 30320	Local Time 2100	Time Zone EST
Airport Proximity: On Airport		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer McDonnell Douglas		Model/Series MD-11		Type of Aircraft Airplane	
Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
<p>On November 11, 1998, about 2100 eastern standard time, a McDonnell Douglas MD-11, N811DE, experienced a fire in the center cargo compartment while the airplane was standing at gate E12 at Hartsfield Atlanta International Airport in Atlanta, Georgia. The airplane was operated by Delta Air Lines under the provisions of Title 14 CFR Part 121. There was no flight plan and weather conditions were undetermined. There were no passengers or crewmembers aboard the airplane and there were no injuries. The airplane received minor damage. The airplane was standing at the time of the fire.</p> <p>The airplane had arrived in Atlanta from Portland, Oregon at 2007, and was being readied for a scheduled departure of 2220 to London, England. During the trip check, airport customer service personnel informed a mechanic that one of the center cargo bay longitudinal spring-lift power drive unit (PDU) powered rollers was inoperative and in the "up" position. The longitudinal powered rollers move cargo bins forward and aft in the cargo compartment.</p> <p>According to the mechanic, he removed the powered rollers after the airport customer service personnel removed the last container from the cargo compartment. He stated that he did not have the McDonnell Douglas MD-11 Maintenance Manual in his possession at the time, and that he had to return to the shop to review the manual. According to the mechanic, he did not open the circuit breaker for the cargo control unit (CCU) that controls the operation of the powered rollers, nor did he tag the system out of service as stipulated in the McDonnell Douglas MD-11 Maintenance Manual.</p> <p>While the mechanic was away from the airplane obtaining a new powered roller, the airport customer service had a crew change. The new crew, unaware that the powered roller cannon plug had been left on the floor of the cargo compartment, began loading cargo bins. The cannon plug was run over and its connecting wires cut by the cargo bin. At that time, the external power source to the airplane dropped off-line. It was not determined if the loss of ramp power was a coincidence as Delta reported previous occurrences of that ramp power dropping off line, or if it resulted from the short of the powered roller's wires.</p> <p>A Delta technician started the airplane's auxiliary power unit (APU) to provide electrical power to the airplane. Other Delta technicians who were servicing the cabin observed smoke and 4 to 6 inch flames behind a floor vent of the main passenger cabin at row 12. The airplane's APU power was turned off as the technicians prepared to discharge a fire extinguisher through the cabin floor vent, and the flames were subsequently extinguished.</p> <p>The CCU is mounted near the aft cargo door and is an electrical unit used to load containers onto the airplane. It receives a 115 volt, 3-phase alternating current (AC) via ground bus power, distributes power throughout the system, and provides the switching logic that commands electrically-powered rollers which are mounted throughout the cargo floor. The CCU is protected by</p>					
FACTUAL REPORT - AVIATION					
Page 1					

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: ATL99IA015
	Occurrence Date: 11/08/1998
	Occurrence Type: Incident

Narrative (Continued)

three 10-amp circuit breakers. Following the incident, the CCU and insulation material behind it were removed, and the airplane was put back into service.

Subsequently, the insulation blanket, the powered roller, its associated cannon plug and wiring, and the CCU were examined by Delta Air Lines, Safety Board, and Lucas Aerospace Cargo Systems investigators. Several of the cannon plug wires were severed and exhibited blackening and sooting of the wire insulation consistent with electrical arcing. The lower shelf of the CCU that served as the mounting point for the input cannon plugs exhibited sooting that disappeared beneath the CCU back plate. The back plate exhibited a blackened and sooted area adjacent to the AC power output line for the printed circuit card J4. This is the circuit card that distributes AC power to the powered rollers. Several powered rollers are protected by a 10 amp 3-phase circuit breaker upstream from the CCU. According to Delta Air Lines maintenance supervisors, this circuit breaker was found closed following the event.

The manufacturer of the cargo handling system installed in the airplane, Lucas Aerospace Cargo Systems, stated that Lucas Aerospace Service Bulletin 462650-25-01, dated April 17, 1998, had not been incorporated into the CCU installed in this airplane. The purpose of the Service Bulletin was to upgrade the motherboard power input connector pins, as problems had been previously identified with the original CCU motherboard electrical pins due to their undersized diameters and the use of a copper alloy that had higher resistance than desired. The installed CCU was of a configuration that was known to be susceptible to damage when exposed to short circuits.

The examination of the failed CCU indicated that the damage was consistent with the circuit location observed in the wire harness for the damaged powered roller. The power input connector pins (connector J4) associated with the damaged roller were observed to be blackened and melted. The CCU back plate installed in contact with the burned metalized mylar insulation blanket displayed heavy sooting and evidence of overheating that was aligned with the damaged connector pins. The damaged insulation blanket exhibited the maximum scorching damage at its contact point with the area of scorching on the CCU back plate.

The examination of the CCU revealed that the wiring damage created an excessive electrical current that vaporized several electrical pins inside the CCU. The pins are designed to distribute electrical power from the airplane's 115-volt AC ground power bus to the CCU's printed circuit motherboard assembly, but were not capable of sufficiently conducting the excessive current spike. Failure of the pins allowed hot gases to escape the back cover of the CCU and ignite the adjacent mylar insulation blanket.

Following the examination of the CCU, a discussion was held among the Lucas Aerospace Cargo Systems, Boeing Aircraft, Delta Air Lines, and Safety Board investigators. It was noted that there had been similar short circuit events that resulted in a similarly damaged CCU, even with the upgraded configuration. In its engineering report, Lucas states, "It was clear that Lucas Service Bulletin 462650-25-01, while improving the current carrying capability of the CCU, does not eliminate all possibility of damage resulting from shorted power lines." During the discussion, it was agreed that (1) low impedance short circuits occurring in circuits controlled by the CCU result in current spikes which can exceed 1000 amps, and (2) the 10 amp circuit breakers (P/N 5D0003-10) in the Boeing Long Beach circuit breaker panel do not respond to these current spikes quickly enough to prevent damage to the CCU.

Subsequently, testing by Lucas to mitigate the effects of short circuit occurrences resulted in the following actions; (1) a service modification by Boeing to replace all 3-phase 10 amp circuit breakers upstream of the CCU with 5 amp breakers, (2) a Service Bulletin by Boeing to "add a fire resistant barrier between the CCU and the flammable liner of the insulation blanket," and (3) replacement of all motherboard connector pins, by Lucas Aerospace Cargo Systems, with newer enhanced pins having higher conductivity and larger diameters.

National Transportation Safety Board

FACTUAL REPORT

AVIATION




NTSB ID: ATL99IA015


Occurrence Date: 11/08/1998

Occurrence Type: Incident

Narrative (Continued)

According to the McDonnell Douglas MD-11 Maintenance Manual, instructions for removal of the longitudinal power rollers states; "WARNING: tag and use safety clips to safety the circuit breakers. If the circuit breakers are not opened, tagged, and safetied, injury to persons and damage to equipment can occur."

 National Transportation Safety Board FACTUAL REPORT AVIATION		NTSB ID: ATL99IA015				
		Occurrence Date: 11/08/1998				
		Occurrence Type: Incident				
Landing Facility/Approach Information						
Airport Name HARTSFIELD ATLANTA INT'L		Airport ID: ATL	Airport Elevation Ft. MSL	Runway Used 0	Runway Length	Runway Width
Runway Surface Type:						
Runway Surface Condition:						
Type Instrument Approach:						
VFR Approach/Landing:						
Aircraft Information						
Aircraft Manufacturer McDonnell Douglas		Model/Series MD-11		Serial Number 48566		
Airworthiness Certificate(s): Transport						
Landing Gear Type: Retractable - Tricycle						
Homebuilt Aircraft? No		Number of Seats: 262	Certified Max Gross Wt. 625500 LBS		Number of Engines: 3	
Engine Type: Turbo Fan		Engine Manufacturer: P&W		Model/Series: 4460/4000	Rated Power: 60000 LBS	
- Aircraft Inspection Information						
Type of Last Inspection Continuous Airworthiness		Date of Last Inspection 11/1998	Time Since Last Inspection 0 Hours		Airframe Total Time 23781 Hours	
- Emergency Locator Transmitter (ELT) Information						
ELT Installed? No		ELT Operated?		ELT Aided in Locating Accident Site?		
Owner/Operator Information						
Registered Aircraft Owner WILMINGTON TRUST CO.		Street Address 1100 N MARKET ST RODNEY SQ				
		City WILMINGTON		State DE	Zip Code 19890	
Operator of Aircraft DELTA AIR LINES INC.		Street Address HARTSFIELD ATLANTA INTL APT				
		City ATLANTA		State GA	Zip Code 30320	
Operator Does Business As:				Operator Designator Code: DALA		
- Type of U.S. Certificate(s) Held:						
Air Carrier Operating Certificate(s): Flag Carrier/Domestic						
Operating Certificate:			Operator Certificate:			
Regulation Flight Conducted Under: Part 121: Air Carrier						
Type of Flight Operation Conducted: Scheduled; International; Passenger Only						

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: ATL99IA015	
	Occurrence Date: 11/08/1998	
	Occurrence Type: Incident	

First Pilot Information

Name	City	State	Date of Birth	Age
------	------	-------	---------------	-----

Sex: U	Seat Occupied: Unknown	Principal Profession: Unknown	Certificate Number:
--------	------------------------	-------------------------------	---------------------

Certificate(s):

Airplane Rating(s):

Rotorcraft/Glider/LTA:

Instrument Rating(s):

Instructor Rating(s):

Type Rating/Endorsement for Accident/Incident Aircraft?	Current Biennial Flight Review?
---	---------------------------------

Medical Cert.: Unknown	Medical Cert. Status: Unknown	Date of Last Medical Exam:
------------------------	-------------------------------	----------------------------

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time										
Pilot In Command(PIC)										
Instructor										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

Seatbelt Used?	Shoulder Harness Used?	Toxicology Performed?	Second Pilot?
----------------	------------------------	-----------------------	---------------

Flight Plan/Itinerary

Type of Flight Plan Filed: Unknown

Departure Point	State	Airport Identifier	Departure Time	Time Zone
			0000	

Destination	State	Airport Identifier	
Local Flight			


Type of Clearance:

Type of Airspace:

Weather Information

Source of Briefing:

Method of Briefing:

 <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p>	NTSB ID: ATL99IA015
	Occurrence Date: 11/08/1998
	Occurrence Type: Incident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
	0000		0 Ft. MSL	0 NM	0 Deg. Mag.

Sky/Lowest Cloud Condition: Unknown	0 Ft. AGL	Condition of Light: Not Reported
-------------------------------------	-----------	----------------------------------

Lowest Ceiling: Unknown	0 Ft. AGL	Visibility: 0 SM	Altimeter: "Hg
-------------------------	-----------	------------------	----------------

Temperature: °C	Dew Point: °C	Wind Direction:	Density Altitude: Ft.
-----------------	---------------	-----------------	-----------------------

Wind Speed:	Gusts:	Weather Conditions at Accident Site:
-------------	--------	--------------------------------------

Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM	Intensity of Precipitation: Unknown
-------------------------	-----------------------	-------------------------------------

Restrictions to Visibility:

Type of Precipitation:

Accident Information

Aircraft Damage: Minor	Aircraft Fire: Ground	Aircraft Explosion: None
------------------------	-----------------------	--------------------------

Classification: U.S. Registered/U.S. Soil

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot					
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew				4	4
Passengers					
- TOTAL ABOARD -				4	4
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	4	4

National Transportation Safety Board

FACTUAL REPORT

AVIATION



NTSB ID: ATL99IA015

Occurrence Date: 11/08/1998

Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

PRESTON E. HICKS

Additional Persons Participating in This Accident/Incident Investigation:

ATLANTA FSDO
ATLANTA, GA 30337