Ground collision with tug, McDonnell Douglas MD-88, April 22, 2003

Micro-summary: **This McDonnell Douglas MD-88 collided with a tug during pushback.**

Event Date: **2003-04-22 at 1252 MDT**

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

Investigative Body's Web Site: **http://www.ntsb.gov/**

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National Transportation Safety Board

FACTUAL REPORT AVIATION

	NTSB ID: DEN03FA070	Aircraft Registration Number: N974DL
	Occurrence Date: 04/22/2003	Most Critical Injury: Minor
	Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
Denver	CO	80249	1252	MDT	

Airport Proximity: On Airport	Distance From Landing Facility: 1	Direction From Airport:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas	MD-88	Airplane

Sightseeing Flight: No

Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

HISTORY OF FLIGHT

On April 22, 2003, at 1252 mountain daylight time, a McDonnell Douglas MD-88, N974DL, owned by Wilmington Trust Company Trustee, Wilmington, Delaware, and operated by Delta Air Lines, Atlanta, Georgia, as Delta flight 964, was substantially damaged when it struck a tug during pushback at Denver International Airport (DEN), Denver, Colorado. The airline transport certificated captain, airline transport certificated first officer, two flight attendants, and 56 passengers were not injured; however, one flight attendant received minor injuries. Visual meteorological conditions prevailed. The scheduled domestic passenger flight was being conducted on an instrument flight rules flight plan under the provisions of Title 14 CFR Part 121. The flight, to Cincinnati, Ohio, was originating at the time of the accident.

According to Delta Air Lines, the airplane arrived in Denver at 0951 as Delta flight 1185. Delta Flight 964 was scheduled to depart at 1100, but was delayed due to the previous flight crews' report of a take off slat warning light indication problem. A maintenance check was completed and pushback for flight 964 occurred at 1206.

According to data obtained by the airplane's cockpit voice recorder (CVR), at 1224, while the crew was completing the pre-take off checks during the taxi, the captain reported another take off slat warning light indication problem. Delta maintenance requested that the captain return the airplane to the gate so maintenance personnel could re-examine the fault. If possible, maintenance could "placard" the minimum equipment list (MEL) item so the flight could continue. The airplane arrived back at the gate at 1239.

At 1241, a Delta maintenance technician boarded the airplane to assess the problem. He stated to the captain that "were gonna [sic] have to mess up with your takeoff condition here and you know after we do this, you're not supposed to move anything." The captain stated "right." During the maintenance check for the slat indication problem, the procedures, as identified in MD-88 MEL 27-00-37, state that "either or both" engine throttles must be advanced to verify the operation of the slat takeoff warning horn. The operation of the system was verified and the slats were set in the takeoff configuration. During the entire maintenance check, the captain and first officer remained seated.

At 1251, following the completion of the second maintenance check, the first officer called for and received pushback clearance. The engines were started during pushback, and the captain stated that "prior to the engine start sequence, I did not direct re-accomplishment of the before start checklist." The captain said "the pushback and initial stages of the engine start sequence appeared normal." However, shortly after engine start and with the tug still attached, the airplane began to move forward under its own power. At that time, the captain noticed that the throttles were still advanced. The captain and first officer both reached to pull the engine throttles back to idle, but

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Narrative (Continued)

the airplane had moved forward enough to cause the tug and tow bar to jackknife to the left. The captain shut down the engines, secured the cockpit, and assessed the situation. Although one flight attendant received minor injuries to her shoulder, there were no other injuries to any ground handling personnel, crew, the remaining two flight attendants, or the 56 passengers.

PERSONNEL INFORMATION

According to FAA records, the captain held an airline transport certificate with an airplane multiengine land rating. He held a first class medical certificate dated November 14, 2002, with no waivers or limitations noted. According to the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1/2), submitted by Delta Air Lines, the captain had a total flight time of 2,941 hours in all aircraft, 2,112 hours in this make and model, of which, 190 hours were in the last 90 days and 4 hours in the previous 24 hours.

According to FAA records, the first officer held an airline transport certificate with an airplane multiengine land rating. He held a first class medical certificate dated July 5, 2002, with no waivers or limitations noted. According to the 6120.1/2 submitted by Delta Air Lines, the first officer had a total flight time of 3,345 hours in all aircraft, 2,234 hours in this make and model, of which, 173 hours were in the last 90 days and 4 hours in the previous 24 hours.

AIRCRAFT INFORMATION

The airplane was a transport category, fixed wing, multiengine, 149 seat McDonnell Douglas MD-88. The airplane was manufactured by the McDonnell Douglas Aircraft Company in 1991 as serial number 53242. The airplane was equipped with two 19,000 lbs. Thrust, Pratt & Whitney (P&W) JT8D-219 turbofan engines. At the time of the accident, the airplane had accumulated a total of 33,331.5 flight hours, which included 26,221 cycles.

WRECKAGE AND IMPACT INFORMATION

The nose landing gear was rotated approximately 120 degrees left of center. The right front corner of the tug struck the left side of the airplane's fuselage approximately 6 feet aft of the main cabin door and approximately 4 feet below the cabin floor. The impact with the tug tore a hole approximately 4 feet by 2 feet in length along the left side of the fuselage, substantially damaging several station bulkheads.

TESTS AND RESEARCH

According to an NTSB Vehicle Recorders Division Engineer, on April 25, 2003, the airplane's flight data recorder (FDR), a Lockheed Model 209, s/n 4387, manufactured by Lockheed Aircraft Services, was examined. The recorder was in good condition, and the data was extracted normally from the recorder. This model 209 FDR records configuration data using an analog signal. The FDR records 64 words of digital information every second of relative time. Each second of recorded information is called a sub frame and is identified by a Sub frame Reference Number (SRN).

The data indicated that electrical power was restored to the FDR at SRN 46176. At SRN 46178, the data indicated that the left engine fuel flow increased from 328 pounds per hour (PPH) to 626 PPH. At SRN 46182, engine pressure ratio (EPR) for the left engine began increasing and N1 for left engine was at 10 percent. During this time, the right engine indicated holding with N1 at 0 percent, EPR at 1 and engine fuel flow unchanged at 109 PPH. Between SRN 46212 and 46216, longitudinal acceleration increased from -0.1 to 0.12 g, and then decreased to -0.31 g by SRN

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Narrative (Continued)

46220. At SRN 46221, the left engine parameters continued increasing, the EPR was at its maximum of 2.09, and N1 had increased to 98 percent. The right engine EPR continued unchanged at 1, and N1 was at 10 percent. During these times, vertical acceleration reached a minimum of 0.95 g and a maximum of 1.06 g. At SRN 46226, the left engine parameters began decreasing and EPR was at 1.13, and N1 was 51 percent. Electrical power was then removed from the FDR.

ADDITIONAL INFORMATION

As outlined in MD-88 MEL 27-00-37, the procedures in step 11 identify that "either or both" engine throttles must be advanced to verify the operation of the slat takeoff warning horn. However, MD-88 MEL 27-00-37 does not include a step to retard the throttles.

Following this investigation, the maintenance procedures, as identified in MD-88 MEL 27-00-32, MD-88 MEL 27-00-36, MD-88 MEL 27-00-37, and similar procedures, as identified in MD-90 MEL 27-84-01, and MD-90 MEL 27-84-02, were revised with approval from Boeing. The MEL's now include a final step that states, "Return both throttles to idle and system controls to normal position."

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NTSB ID: DEN03FA070

Occurrence Date: 04/22/2003

Occurrence Type: Accident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
Denver International	DEN	5431 Ft. MSL	NA		

Runway Surface Type: Unknown

Runway Surface Condition: Unknown

Type Instrument Approach: Unknown

VFR Approach/Landing: Unknown

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas	MD-88	53242

Airworthiness Certificate(s): Transport

Landing Gear Type: Retractable - Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	149	149500 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	Pratt & Whitney	JT8D219	19000 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Continuous Airworthiness	04/2003	10.9 Hours	33331.5 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?
Yes	No	No

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
Wilmington Trust Co.	Rodney Square North	Wilmington	DE	19890

Operator of Aircraft	Street Address	City	State	Zip Code
Same as Reg'd Aircraft Owner	Same as Reg'd Aircraft Owner			

Operator Does Business As: Delta Air Lines

Operator Designator Code: 026A

- 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; Domestic; Passenger Only

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NTSB ID: DEN03FA070

Occurrence Date: 04/22/2003

Occurrence Type: Accident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	48

Sex: M | Seat Occupied: Left | Principal Profession: Civilian Pilot | Certificate Number: On File

Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Type Rating/Endorsement for Accident/Incident Aircraft? Yes | Current Biennial Flight Review? 08/2002

Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 11/2002

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	2941	2112								
Pilot In Command(PIC)										
Instructor										
Last 90 Days	190	190								
Last 30 Days										
Last 24 Hours	4	4								

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? No | Second Pilot? Yes

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
Same as Accident/Incident Location		DEN	1245	MDT

Destination	State	Airport Identifier
Cincinnati	OH	LUK

Type of Clearance: IFR

Type of Airspace: Class B

Weather Information

Source of Briefing: Company

Method of Briefing: Aircraft Radio; Telephone

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NTSB ID: DEN03FA070

Occurrence Date: 04/22/2003

Occurrence Type: Accident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
DEN	1245	MDT	5431 Ft. MSL	NM	Deg. Mag.

Sky/Lowest Cloud Condition: Scattered 70 Ft. AGL

Condition of Light: Day

Lowest Ceiling: Broken 150 Ft. AGL

Visibility: 10 SM

Altimeter: 29.75 "Hg

Temperature: 14 °C

Dew Point: 4 °C

Wind Direction: Variable

Density Altitude: 6747 Ft.

Wind Speed: 3

Gusts:

Weather Condtions at Accident Site: Visual Conditions

Visibility (RVR): Ft.

Visibility (RVV) SM

Intensity of Precipitation:

Restrictions to Visibility: None

Type of Precipitation: None

Accident Information

Aircraft Damage: Substantial

Aircraft Fire: None

Aircraft Explosion None

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

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot				1	1
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants			1	2	3
Other Crew					
Passengers				56	56
- TOTAL ABOARD -			1	60	61
Other Ground					
- GRAND TOTAL -			1	60	61

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FACTUAL REPORT
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Occurrence Date: 04/22/2003

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

Brannon D. Mayer

Additional Persons Participating in This Accident/Incident Investigation:

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