



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	DENVER, CO	<b>Accident Number:</b>	FTW96LA111
<b>Date &amp; Time:</b>	02/04/1996, 1647 MST	<b>Registration:</b>	N957DL
<b>Aircraft:</b>	MCDONNELL DOUGLAS MD-88	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	1 Minor, 119 None
<b>Flight Conducted Under:</b>	Part 121: Air Carrier - Scheduled		

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## Analysis

The captain said he flew what he considered to be a normal, stabilized approach, using 28 degrees of flaps and a Vref speed of 133 knots plus 5 knots. He flared the airplane over the runway and realized the sink rate was not being arrested as desired. He made a more 'aggressive' pull on the control yoke while advancing the thrust levers a 'significant amount.' The airplane landed hard, sustaining substantial damage. DFDR readout disclosed that the airspeed remained above Vref+5 knots until, at a radio altimeter altitude of 238 feet, it was 138.75 knots; thereafter, it began to drop. When the airplane touched down on the runway, airspeed was 124.75 knots, and the pitch attitude was 10.62 degrees nose up. There was a +5.54 'G' vertical acceleration spike.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Failure of the pilot to maintain sufficient airspeed to properly flare the airplane during the landing.

## Findings

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Occurrence #1: HARD LANDING  
Phase of Operation: LANDING - FLARE/TOUCHDOWN

### Findings

1. (C) AIRSPEED(VREF) - NOT MAINTAINED - PILOT IN COMMAND
2. (C) FLARE - IMPROPER - PILOT IN COMMAND

## Factual Information

On February 4, 1996, at 1647 mountain standard time, a McDonnell Douglas MD-88, N957DL, operated by Delta Air Lines, Inc., as flight 1879, scheduled domestic passenger service under Title 14 CFR Part 121, sustained substantial damage during a hard landing at Denver International Airport. Visual meteorological conditions prevailed at the time, and an IFR flight plan had been filed. The captain, first officer, two flight attendants, and 115 passengers were not injured, but one flight attendant did sustain a minor injury. The flight originated at Dallas-Fort Worth International Airport, Texas, approximately 1 hour, 44 minutes before the accident.

According to the captain's statement, he flew what he considered to be a normal, stabilized approach, using 28 degrees of flaps and a VREF speed of 133 knots plus 5 knots. He flared the airplane over the runway and realized the sink rate was not being arrested as desired. He made a more "aggressive" pull on the control yoke while advancing the thrust levers "a significant amount. A very firm touchdown occurred." Examination disclosed damage to the tail bumper and wrinkled skin.

Readout of the airplane's digital flight data recorder (DFDR) disclosed subframes 1584 through 1589 contained the accident data, with subframe 1587 containing the runway contact data. The readout showed airspeed remained above VREF+5 up until subframe 1568, when, at a radio altimeter altitude of 238 feet, it was at 138.75 knots; thereafter, it began to drop. When the airplane touched down on the runway, airspeed was 124.75 knots, and the pitch attitude was 10.62 degrees nose up. There was a +5.54 vertical acceleration spike (see attached DFDR factual report).

## Pilot Information

<b>Certificate:</b>	Airline Transport; Commercial; Flight Engineer	<b>Age:</b>	48, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Valid Medical--w/ waivers/lim.	<b>Last FAA Medical Exam:</b>	01/03/1996
<b>Occupational Pilot:</b>	<b>Last Flight Review or Equivalent:</b>		
<b>Flight Time:</b>	14954 hours (Total, all aircraft), 4515 hours (Total, this make and model), 186 hours (Last 90 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	MCDONNELL DOUGLAS	<b>Registration:</b>	N957DL
<b>Model/Series:</b>	MD-88 MD-88	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	49976
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	150
<b>Date/Type of Last Inspection:</b>	01/17/1996, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	149500 lbs
<b>Time Since Last Inspection:</b>	128 Hours	<b>Engines:</b>	2 Turbo Fan
<b>Airframe Total Time:</b>	16529 Hours	<b>Engine Manufacturer:</b>	P&W
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	JT8D-219
<b>Registered Owner:</b>	WILMINGTON TRUST COMPANY	<b>Rated Power:</b>	15500 lbs
<b>Operator:</b>	DELTA AIR LINES	<b>Operating Certificate(s) Held:</b>	Flag carrier (121)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	DALA

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	DEN, 5431 ft msl	<b>Distance from Accident Site:</b>	0 Nautical Miles
<b>Observation Time:</b>	1653 MST	<b>Direction from Accident Site:</b>	0°
<b>Lowest Cloud Condition:</b>	Clear / 0 ft agl	<b>Visibility</b>	10 Miles
<b>Lowest Ceiling:</b>	None / 0 ft agl	<b>Visibility (RVR):</b>	0 ft
<b>Wind Speed/Gusts:</b>	8 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	330°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30 inches Hg	<b>Temperature/Dew Point:</b>	9°C / -11°C
<b>Precipitation and Obscuration:</b>			
<b>Departure Point:</b>	DFW AIRPORT, TX (DFW)	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	(DEN)	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	1605 CST	<b>Type of Airspace:</b>	Class B

## Airport Information

<b>Airport:</b>	DENVER INTERNATIONAL (DEN)	<b>Runway Surface Type:</b>	Concrete
<b>Airport Elevation:</b>	5431 ft	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	35L	<b>IFR Approach:</b>	Visual
<b>Runway Length/Width:</b>	12000 ft / 150 ft	<b>VFR Approach/Landing:</b>	Full Stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Minor, 4 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	115 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Minor, 119 None	<b>Latitude, Longitude:</b>	

## Administrative Information

<b>Investigator In Charge (IIC):</b>	ARNOLD W SCOTT	<b>Report Date:</b>	05/17/1996
<b>Additional Participating Persons:</b>	RAYMOND J RYAN; DENVER, CO		
<b>Publish Date:</b>			
<b>Investigation Docket:</b>	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).