



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	PHOENIX, AZ	<b>Accident Number:</b>	LAX99FA207
<b>Date &amp; Time:</b>	06/02/1999, 2026 MST	<b>Registration:</b>	N656DL
<b>Aircraft:</b>	Boeing 757-232	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>		<b>Injuries:</b>	127 None
<b>Flight Conducted Under:</b>	Part 121: Air Carrier - Scheduled		

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## Analysis

The airplane sustained substantial structural damage to the nose wheel well aft bulkhead during a hard landing. The en route flight from New York to Phoenix was uneventful. About 3 seconds before touchdown, at the termination of a visual approach, the airplane's pitch attitude increased to 5.8 degrees. The captain, who was the flying pilot, described the first touchdown as being 'firm,' and in the runway's touchdown zone, close to the centerline. There was a maintenance carry over (MCO) disabling the auto-spoiler deployment system, so the first officer manually deployed the spoilers upon touchdown. The captain stated he then applied forward pressure to the control yoke. The captain additionally reported that he 'felt a jolt' as the nose gear returned to the runway. After landing, the airplane taxied to the gate. It was subsequently examined and substantial damage was observed to the airplane's nose gear wheel well aft bulkhead, associated underlying structure, and skin panels. The digital flight data recorder was read out and it revealed that approximately 3 seconds prior to touchdown, the pitch attitude started increasing in response to nose up elevator inputs to a maximum pitch of about 5.8 degrees, and the airplane touched down (transitioned from air to ground) then became airborne again. The second air to ground transition occurred 3 seconds later and the elevator positions changed over the next second from plus 6 degrees to minus 16 degrees as the pitch attitude rapidly decreased to -0.7 degrees at a rate of 4 degrees per second. There was no evidence of any mechanical malfunctions during the landing event.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's excessive and rapid forward control column movement in response to a bounced landing, which resulted in the hard touchdown of the nose wheel.

## Findings

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Occurrence #1: HARD LANDING

Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings

1. RECOVERY FROM BOUNCED LANDING - INITIATED - PILOT IN COMMAND
2. (C) ELEVATOR - EXCESSIVE - PILOT IN COMMAND

## Factual Information

### HISTORY OF FLIGHT

On June 2, 1999, about 2026 hours mountain standard time, a Boeing 757-232, N656DL, was substantially damaged during a hard landing at the Phoenix Sky Harbor International Airport, Phoenix, Arizona. The airline transport certificated captain, first officer, 6 flight attendants, and 119 passengers were not injured. The flight was operated by Delta Air Lines, Inc., on an instrument flight plan under 14 CFR Part 121 as Flight 491, a scheduled domestic passenger flight. The flight originated from the John F. Kennedy Airport in New York about 1831 eastern daylight time. Visual meteorological conditions prevailed during the landing at Phoenix.

Air traffic control cleared the airplane for a visual approach to runway 26R. The captain, who was handling the flight controls, reported that all phases of the flight up to the landing were uneventful. He described the landing as being "firm," and in the runway's touchdown zone, close to the centerline. There was a maintenance carry over (MCO) disabling the auto-spoiler deployment system, so the first officer manually deployed the spoilers upon touchdown. Thereafter, the airplane's nose pitched upward. The captain stated he then applied forward pressure to the control yoke. The captain additionally reported that he "felt a jolt" as the nose gear returned to the runway.

The first officer also provided a statement regarding the landing events. He concurred with the captain's statements. After landing, the airplane taxied to the gate. The event was originally reported by Delta as being a hard landing incident. However, a subsequent examination of the airplane revealed substantial airframe damage.

### PERSONNEL INFORMATION

Captain.

The captain had about 17,000 total flight hours. His experience flying the Boeing 757 was about 1,446 hours. He had flown this type of airplane for about 185 hours during the preceding 90 days.

First Officer.

The first officer had about 8,000 total flight hours. His experience flying the Boeing 757 was about 1,007 hours. He had flown this type of airplane for about 52 hours during the preceding 90 days.

### AIRPLANE INFORMATION

The airplane was maintained by Delta on a continuous airworthiness program. Its total airframe time was about 32,594 hours.

### METEOROLOGICAL INFORMATION

At 1956, Phoenix reported its surface wind was from 240 degrees at 10 knots, and the visibility was 10 miles. There were few clouds at 20,000 feet.

### AIRPORT AND GROUND FACILITIES

Runway 26R is 11,001 feet long by 150 feet wide.

### FLIGHT RECORDERS

The airplane was equipped with a digital flight data recorder (DFDR), which was removed from the airplane and read out by the National Transportation Safety Board's Vehicle Recorders Laboratory in Washington, D.C. Data for various parameters including altitude, indicated airspeed, magnetic heading, vertical acceleration, engine power, and control surface and airplane orientation (i.e. pitch, roll) was extracted. The parameters for the positions of the control columns and spoilers was not recorded.

The DFDR data indicates that approximately 3 seconds prior to touchdown, the pitch attitude started increasing in response to nose up elevator inputs. The aircraft was descending at 650 feet per minute at approximately 125 knots. When the aircraft was 33 feet agl and at 2.6 degrees pitch, the elevators start to be increased from approximately 0 degrees. The pitch of the airplane increased as the elevators are deflected to 8.5 degrees airplane nose up. The airplane reached a maximum pitch of about 5.8 degrees, a roll right attitude of 3 degrees. The airplane initially touched down (transitioned from air to ground) at an indicated airspeed of 124 knots, and reached a maximum vertical acceleration of 1.36 g's. The next DFDR sample of the air to ground parameter showed a transition back to "air" while the pitch remained close to 5 degrees and the vertical acceleration dropped to 0.6 g's over the next 2 seconds.

The second air to ground transition occurred 3 seconds after the first transition. The indicated airspeed was 121 knots, and the vertical acceleration quickly changes from 0.6 g's to 1.64 g's in 0.5 seconds. The elevator positions changed over the next second from plus 6 degrees to minus 16 degrees and reached a maximum of -20 degrees 1 second later. In response to the elevators, the pitch attitude rapidly decreased from 3.5 degrees to -0.7 degrees at a rotation rate of 4 degrees per second. As the airplane rotated nose down, a maximum vertical acceleration of 1.77 g's is reached as the longitudinal acceleration increases from zero to -0.28 g's. (See the Flight Data Recorder Factual report for additional details.) The Delta participant reported no evidence of any mechanical malfunctions during the landing event.

#### WRECKAGE AND IMPACT INFORMATION

The airframe examination revealed no evidence of a tail strike. The main landing gear was undamaged. A summary of principal airframe structural damage is as follows:

1. Buckled nose gear wheel well aft bulkhead;
2. Buckled skin on both sides of the nose gear wheel well bulkhead; and
3. Damage to associated underlying structure.

#### ADDITIONAL INFORMATION

The Safety Board did not take custody of the airplane.

## Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Engineer	<b>Age:</b>	54, Male
<b>Airplane Rating(s):</b>	Multi-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>	04/19/1999
<b>Occupational Pilot:</b>		<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	17000 hours (Total, all aircraft), 1445 hours (Total, this make and model), 185 hours (Last 90 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Boeing	<b>Registration:</b>	N656DL
<b>Model/Series:</b>	757-232 757-232	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	24396
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	178
<b>Date/Type of Last Inspection:</b>	05/10/1999, Continuous Airworthiness	<b>Certified Max Gross Wt.:</b>	350000 lbs
<b>Time Since Last Inspection:</b>	225 Hours	<b>Engines:</b>	2 Turbo Jet
<b>Airframe Total Time:</b>	32549 Hours	<b>Engine Manufacturer:</b>	P&W
<b>ELT:</b>		<b>Engine Model/Series:</b>	PW2037
<b>Registered Owner:</b>	DELTA AIR LINES, INC.	<b>Rated Power:</b>	37000 lbs
<b>Operator:</b>	DELTA AIR LINES, INC.	<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

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Bright
Observation Facility, Elevation:	PHX, 1135 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1956 MST	Direction from Accident Site:	0°
Lowest Cloud Condition:	Scattered / 20000 ft agl	Visibility	10 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	240°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	29° C / 4° C
Precipitation and Obscuration:			
Departure Point:	NEW YORK, NY (JFK)	Type of Flight Plan Filed:	IFR
Destination:	(PHX)	Type of Clearance:	IFR; VFR
Departure Time:	1831 EDT	Type of Airspace:	Class D

## Airport Information

Airport:	PHOENIX SKY HARBOR INTL. (PHX)	Runway Surface Type:	Asphalt
Airport Elevation:	1133 ft	Runway Surface Condition:	Dry
Runway Used:	26R	IFR Approach:	Visual
Runway Length/Width:	11001 ft / 150 ft	VFR Approach/Landing:	Full Stop

## Wreckage and Impact Information

Crew Injuries:	8 None	Aircraft Damage:	Substantial
Passenger Injuries:	119 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	127 None	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	WAYNE R POLLACK	Report Date:	05/30/2001
Additional Participating Persons:	JOHN D SILL; PHOENIX, AZ JOHN POTTHAST; ATLANTA, GA		
Publish Date:			
Investigation Docket:	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> .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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](#).