



National Transportation Safety Board Aviation Accident Final Report

Location:	CHICAGO, IL	Accident Number:	CHI89MA046
Date & Time:	01/20/1989, 0745 CST	Registration:	N242US
Aircraft:	BOEING 737-201	Aircraft Damage:	Substantial
Defining Event:		Injuries:	33 None

Flight Conducted Under: Part 121: Air Carrier - Scheduled

Analysis

AN IN-FLIGHT TEARAWAY OF THE RIGHT ENGINE (FROM THE RIGHT WING) OCCURRED AS THE AIRPLANE LIFTED OFF FROM THE RUNWAY. THE AIRCREW CONTINUED THE TAKEOFF, THEN RETURNED TO THE AIRPORT & LANDED SAFELY. THE PLANE WAS STOPPED & SHUTDOWN ON THE RUNWAY. AN EXAM OF ITS WING & SEPARATED ENGINE REVEALED THE AFT CONE (ENG MOUNTING) BOLT HAD FAILED FROM FATIGUE, THEN THE TWO FORWARD CONE BOLTS FAILED FROM DUCTILE OVERSTRESS. A RAISED MECHANICAL DEFORMATIVE WAS FOUND ON THE CONICAL SURFACE OF THE AFT BOLT. THE DEFORMITY WAS INDICATIVE OF DAMAGE PRODUCED PRIOR TO OR DURING ASSEMBLY OF THE CONE BOLT IN THE ISOLATION MOUNT. A MATCHING CAVITY WAS NOTED ON THE ISOLATION MOUNT. THERE WAS EVIDENCE THAT THE MECHANICAL IRREGULARITY RESULTED IN A NONUNIFORM FIT WHICH ALLOWED THE TORQUED FITTING TO LOOSEN DURING CYCLIC LOADING. AD 88-01-07 REQUIRED THAT ULTRASONIC INSPECTION OF THE CONE BOLTS BE PERFORMED AT INTERVALS NOT TO EXCEED 600 CYCLES. AN ULTRASONIC INSPECTION OF THE BOLTS HAD BEEN ACCOMPLISHED ABOUT 330 CYCLES BEFORE THE ENGINE SEPARATED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: PREVIOUS DAMAGE TO THE AFT CONE (ENGINE MOUNTING) BOLT, WHICH RESULTED IN MISMATCHED SURFACES BETWEEN THE BOLT AND ISOLATION MOUNT, LOSS OF TORQUE DURING CYCLIC LOADING OF THE MOUNTING BOLT, AND SUBSEQUENT FATIGUE FAILURE OF THE BOLT.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (C) ENGINE INSTALLATION, MOUNTING BOLT - OTHER
2. (C) MAINTENANCE, INSTALLATION - IMPROPER - COMPANY MAINTENANCE PERSONNEL
3. (C) ENGINE INSTALLATION, MOUNTING BOLT - FATIGUE

Occurrence #2: ENGINE TEARAWAY
Phase of Operation: TAKEOFF - INITIAL CLIMB

Factual Information

Pilot Information

Certificate:	Airline Transport	Age:	37, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Single-engine	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	Last Medical Exam:	11/18/1988
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	6105 hours (Total, all aircraft), 3430 hours (Total, this make and model), 195 hours (Last 90 days, all aircraft), 65 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BOEING	Registration:	N242US
Model/Series:	737-201 737-201	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	22444
Landing Gear Type:	Retractable - Tricycle	Seats:	114
Date/Type of Last Inspection:	11/01/1989, Continuous Airworthiness	Certified Max Gross Wt.:	100800 lbs
Time Since Last Inspection:	569 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	19420 Hours	Engine Manufacturer:	P&W
ELT:	Not installed	Engine Model/Series:	JT8D-15
Registered Owner:	PIEDMONT AIRLINES	Rated Power:	15500 lbs
Operator:	PIEDMONT AIRLINES	Air Carrier Operating Certificate:	Flag carrier (121)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	, 0 ft msl	Observation Time:	0000
Distance from Accident Site:	0 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Unknown / 0 ft agl	Temperature/Dew Point:	-2° C / -8° C
Lowest Ceiling:	Broken / 3200 ft agl	Visibility	12 Miles
Wind Speed/Gusts, Direction:	19 knots/ 28 knots, 350°	Visibility (RVR):	0 ft
Altimeter Setting:	30 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:		Type of Flight Plan Filed:	IFR
Destination:	CHARLOTTE, NC (CLT)	Type of Clearance:	IFR
Departure Time:	0745 CST	Type of Airspace:	Class B

Airport Information

Airport:	O'HARE FIELD (ORD)	Runway Surface Type:	Concrete
Airport Elevation:	667 ft	Runway Surface Condition:	Dry
Runway Used:	27L	IFR Approach:	None
Runway Length/Width:	10141 ft / 150 ft	VFR Approach/Landing:	Precautionary Landing

Wreckage and Impact Information

Crew Injuries:	6 None	Aircraft Damage:	Substantial
Passenger Injuries:	27 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	33 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	WILLIAM C BRUCE	Adopted Date:	06/30/1992
Additional Participating Persons:	R. EDWARDS P. COLEY A. THOMAS		
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 pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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