



National Transportation Safety Board Aviation Accident Data Summary

Location:	SEATTLE, WA	Accident Number:	SEA97FA202
Date & Time:	09/01/1997, 2110 PDT	Registration:	N951AS
Aircraft:	McDonnell Douglas DC-9-82 (MD-82)	Injuries:	19 Minor, 97 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

During the landing roll-out, the nose landing gear collapsed. Examination of the nose landing gear revealed the nose gear upper lock link, PN 3914464-503, had failed, and had separated into two pieces. The link, which was subject to recurring non-destructive testing every 5000 cycles (per AD 97-02-10), had an eddy current inspection by the operator, 1075 cycles before the accident. The link was one of a series manufactured from plate stock, rather than being forged. Due to this changed process, the lack of draft angle allowances on the machined parts reduced the load-carrying cross sectional area of the machined links to less than that of the forged links, resulting in a decrease in the overall strength. Metallurgical analysis revealed that about 10,000 major fatigue progression cycles had occurred within about .6 inches of the crack progression. Based on two major stress cycles per gear retraction/extension cycle, the crack length at 1075 cycles before the accident would have been greater than .25 inches. The inspection procedure and process provided by the airframe manufacturer did not specify removal of the upper lock link from the aircraft before recurring non-destructive tests (NDT). During the investigation, NTSB investigators and FAA inspectors observed that access to the upper lock link for NDT was limited when the part remained installed on the airplane.

Probable Cause

The National Transportation Safety Board determines the probable cause(s) of this accident to be: fatigue failure of the nose landing gear upper lock link, due in part to reduced strength after the manufacturing process was changed from forged to machined plate stock; and inadequate non-destructive inspection process for testing the link.

Findings

Occurrence #1: NOSE GEAR COLLAPSED

Phase of Operation: LANDING - ROLL

Findings

1. (C) LANDING GEAR, GEAR LOCKING MECHANISM - FATIGUE
2. (C) ACFT/EQUIP, INADEQUATE AIRCRAFT COMPONENT - MANUFACTURER
3. (C) MAINTENANCE, INSPECTION - INADEQUATE
4. (C) PROCEDURE INADEQUATE - MANUFACTURER

Pilot Information

Certificate:	Airline Transport	Age:	47
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Instrument Rating(s):	Airplane
Other Aircraft Rating(s):	None	Instructor Rating(s):	Instrument Airplane
Flight Time:	27388 hours (Total, all aircraft), 1491 hours (Total, this make and model), 18068 hours (Pilot In Command, all aircraft), 222 hours (Last 90 days, all aircraft), 69 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	McDonnell Douglas	Registration:	N951AS
Model/Series:	DC-9-82 (MD-82) DC-9-82 (M	Engines:	2 Turbo Fan
Operator:	ALASKA AIRLINES	Engine Manufacturer:	P&W
Operating Certificate(s) Held:	Flag carrier (121)	Engine Model/Series:	JT8D-217
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night/Dark
Observation Facility, Elevation:	, 0 ft msl	Weather Information Source:	Pilot
Lowest Ceiling:	Broken / 3800 ft agl	Wind Speed/Gusts, Direction:	6 knots / , 220°
Temperature:	19° C	Visibility	10 Miles
Precipitation and Obscuration:			
Departure Point:	LOS ANGELES, CA (KLAX)	Destination:	(KSEA)

Airport Information

Airport:	SEATTLE-TACOMA INTL (KSEA)	Runway Surface Type:	Asphalt
Runway Used:	16L	Runway Surface Condition:	Dry
Runway Length/Width:	11900 ft / 150 ft		

Wreckage and Impact Information

Crew Injuries:	5 None	Aircraft Damage:	Substantial
Passenger Injuries:	19 Minor, 92 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Latitude, Longitude:			

Administrative Information

Investigator In Charge (IIC): MICHAEL L STOCKHILL

Adopted Date: 04/15/1999

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 pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at <http://dms.nts.gov/pubdms/>.

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