



National Transportation Safety Board Aviation Accident Final Report

Location:	PORTLAND, OR	Accident Number:	SEA99LA014
Date & Time:	11/11/1998, 1120 PST	Registration:	N801DE
Aircraft:	McDonnell Douglas MD-11	Aircraft Damage:	Substantial
Defining Event:		Injuries:	124 None

Flight Conducted Under: Part 121: Air Carrier - Scheduled

Analysis

The flight crew inadvertently entered an incorrect weight figure into the Flight Management System (FMS) computer. This resulted in the approach being flown at 136 knots instead of the correct airspeed of 151 knots. At this airspeed, the aircraft proceeded along the flight path at a pitch attitude of about eight (8) degrees instead of the three or four degrees that would have occurred at the correct airspeed. At this reduced airspeed and excessive attitude, the tail clearance during the flare was reduced to the point where the airframe contacted the runway surface.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flight crew's entry of an incorrect weight figure in the Flight Management System (FMS) computer, resulting in the approach being flown at an improper (low) Vref speed and an excessively nose-high attitude through the landing flare.

Findings

Occurrence #1: DRAGGED WING, ROTOR, POD, FLOAT OR TAIL/SKID
Phase of Operation: LANDING - FLARE/TOUCHDOWN

Findings

1. (C) AIRCRAFT WEIGHT AND BALANCE - INACCURATE - FLIGHTCREW
2. (C) AIRSPEED(VREF) - IMPROPER - FLIGHTCREW
3. (C) ROTATION - EXCESSIVE - COPILOT/SECOND PILOT

Factual Information

On November 11, 1998, at 1120 Pacific standard time, a McDonnell Douglas MD-11, N801DE, operated by Delta Air Lines as a 14 CFR Part 121 scheduled passenger flight, experienced a tail strike while landing at Portland International Airport, Portland, Oregon. The flight was landing on runway 10R after arriving from Cincinnati, Ohio. Visual meteorological conditions prevailed, and an instrument flight plan had been filed. There were no injuries to the 11 crew members or 113 passengers, but the aircraft sustained substantial damage to the belly skin and stringers.

The flight crew stated that they were unaware the aircraft had experienced a tail strike until maintenance personnel at the arrival gate advised them that there was damage to the number 3 VHF antenna and the skin aft of the antenna mount. After the passengers were deplaned normally through the jetway, the damage was further evaluated, and it was determined that the aircraft would need to be ferried to Atlanta for permanent repair.

During the investigation, it was determined that the weight existing in the Flight Management System (FMS) during the approach and landing sequence was in error approximately 100,000 pounds. As confirmed by a review of the Flight Data Recorder (FDR) readout, the FMS weight was about 292,000 pounds, when in fact the actual aircraft landing weight was approximately 392,000 pounds. This error generated a final approach speed of 136 knots for an approach that should have been flown at 151 knots. This reduced speed resulted in the approach being flown at an eight (8) degree pitch attitude instead of the three to four degrees that would occur during an approach flown at the correct airspeed. The FDR data also showed that approximately 7 seconds before nose gear strut compression, the pitch attitude reached 10.9 degrees. According to the operator, while landing at this speed and attitude "... tail clearance tolerances are minimal."

Although the exact FMS entry error was not determined, the most likely would be the crew missing the hundred thousand entry by one when inputting the takeoff gross weight, entering the empty weight into the zero fuel weight prompt, or entering the zero fuel weight in the aircraft takeoff gross weight prompt.

According to the operator, as a result of the lessons learned from this accident, Delta Air Lines is putting additional emphasis on the MD-11 FMS loading procedures during flight training and line checks. In addition, Delta is implementing a program that stresses awareness of proper pitch attitude while in the final approach mode.

Pilot Information

Certificate:	Airline Transport; Commercial; Flight Engineer	Age:	56, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	Last Medical Exam:	07/02/1998
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	10000 hours (Total, all aircraft), 4082 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	McDonnell Douglas	Registration:	N801DE
Model/Series:	MD-11 MD-11	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	48565
Landing Gear Type:	Retractable - Tricycle	Seats:	262
Date/Type of Last Inspection:	11/10/1999, Continuous Airworthiness	Certified Max Gross Wt.:	625000 lbs
Time Since Last Inspection:	5 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	24332 Hours	Engine Manufacturer:	P&W
ELT:	Not installed	Engine Model/Series:	PW 4460
Registered Owner:	DELTA AIR LINES, INC.	Rated Power:	60000 lbs
Operator:	DELTA AIR LINES, INC.	Air Carrier Operating Certificate:	Flag carrier (121)
Operator Does Business As:	DELTA AIR LINES	Operator Designator Code:	DALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	KPD, 20 ft msl	Observation Time:	1156 PST
Distance from Accident Site:	1 Nautical Miles	Direction from Accident Site:	0°
Lowest Cloud Condition:	Scattered / 3500 ft agl	Temperature/Dew Point:	8° C / 6° C
Lowest Ceiling:	Broken / 6500 ft agl	Visibility	10 Miles
Wind Speed/Gusts, Direction:	4 knots, 140°	Visibility (RVR):	0 ft
Altimeter Setting:	30 inches Hg	Visibility (RVV):	0 Miles
Precipitation and Obscuration:			
Departure Point:	CINCINNATI, OH (CVG)	Type of Flight Plan Filed:	IFR
Destination:	(PDX)	Type of Clearance:	IFR
Departure Time:	0940 CST	Type of Airspace:	Class D

Airport Information

Airport:	PORTLAND INTERNATIONAL (PDX)	Runway Surface Type:	Concrete
Airport Elevation:	20 ft	Runway Surface Condition:	Dry
Runway Used:	10R	IFR Approach:	Visual
Runway Length/Width:	11000 ft / 150 ft	VFR Approach/Landing:	Full Stop

Wreckage and Impact Information

Crew Injuries:	11 None	Aircraft Damage:	Substantial
Passenger Injuries:	113 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	124 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	ORRIN K ANDERSON	Adopted Date:	09/28/2000
Additional Participating Persons:	RON HOLLOWAY; HILLSBORO, OR		
Publish Date:			
Investigation Docket:	NTSB accident and incident docket 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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