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## Tail strike on landing, McDonnell Douglas MD-11, November 11, 1998

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**Micro-summary: An FMS error resulted in this McDonnell Douglas MD-11 flying a too-slow approach, resulting in a tailstrike.**

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**Event Date: 1998-11-11 at 1120 PST**

**Investigative Body: National Transportation Safety Board (NTSB), USA**


**Investigative Body's Web Site: <http://www.nts.gov/>**


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|--|--|---------------------------------|----------------------------------|--------------------------------------|------------------|
| <br><b>National Transportation Safety Board</b><br><b>FACTUAL REPORT</b><br><b>AVIATION</b>   |  | NTSB ID: SEA99LA014             |                                  | Aircraft Registration Number: N801DE |                  |
|  |  | Occurrence Date: 11/11/1998     |                                  | Most Critical Injury: None           |                  |
|  |  | Occurrence Type: Accident       |                                  | Investigated By: NTSB                |                  |
| <b>Location/Time</b>   |  |                                 |                                  |                                      |                  |
| Nearest City/Place<br>PORTLAND   |  | State<br>OR                     | Zip Code<br>97218                | Local Time<br>1120                   | Time Zone<br>PST |
| Airport Proximity: On Airport  |  | Distance From Landing Facility: |                                  | Direction From Airport:              |                  |
| <b>Aircraft Information Summary</b>  |  |                                 |                                  |                                      |                  |
| Aircraft Manufacturer<br>McDonnell Douglas   |  | Model/Series<br>MD-11           |                                  | Type of Aircraft<br>Airplane         |                  |
| Sightseeing Flight: No   |  |                                 | Air Medical Transport Flight: No |                                      |                  |
| <b>Narrative</b>   |  |                                 |                                  |                                      |                  |
| Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:   |  |                                 |                                  |                                      |                  |
| <p>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.</p> <p>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.</p> <p>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."</p> <p>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.</p> <p>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.</p> |  |                                 |                                  |                                      |                  |
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|--|-------------------------|--------------------------------------|--------------------------------|----------------------|--------------|
| <br><b>National Transportation Safety Board</b><br><b>FACTUAL REPORT</b><br><b>AVIATION</b> |                         | NTSB ID: SEA99LA014                  |                                |                      |              |
|  |                         | Occurrence Date: 11/11/1998          |                                |                      |              |
|  |                         | Occurrence Type: Accident            |                                |                      |              |
| <b>Landing Facility/Approach Information</b>   |                         |                                      |                                |                      |              |
| Airport Name   | Airport ID:             | Airport Elevation                    | Runway Used                    | Runway Length        | Runway Width |
| PORTLAND INTERNATIONAL   | PDX                     | 20 Ft. MSL                           | 10R                            | 11000                | 150          |
| Runway Surface Type: Concrete  |                         |                                      |                                |                      |              |
| Runway Surface Condition: Dry  |                         |                                      |                                |                      |              |
| Type Instrument Approach: Visual   |                         |                                      |                                |                      |              |
| VFR Approach/Landing: Full Stop  |                         |                                      |                                |                      |              |
| <b>Aircraft Information</b>  |                         |                                      |                                |                      |              |
| Aircraft Manufacturer  |                         | Model/Series                         |                                | Serial Number        |              |
| McDonnell Douglas  |                         | MD-11                                |                                | 48565                |              |
| Airworthiness Certificate(s): Transport  |                         |                                      |                                |                      |              |
| Landing Gear Type: Retractable - Tricycle  |                         |                                      |                                |                      |              |
| Homebuilt Aircraft? No   | Number of Seats: 262    | Certified Max Gross Wt.              | 625000 LBS                     | Number of Engines: 2 |              |
| Engine Type:   | Engine Manufacturer:    | Model/Series:                        | Rated Power:                   |                      |              |
| Turbo Fan  | P&W                     | PW 4460                              | 60000 LBS                      |                      |              |
| - Aircraft Inspection Information  |                         |                                      |                                |                      |              |
| Type of Last Inspection  | Date of Last Inspection | Time Since Last Inspection           | Airframe Total Time            |                      |              |
| Continuous Airworthiness   | 11/1999                 | 5 Hours                              | 24332 Hours                    |                      |              |
| - Emergency Locator Transmitter (ELT) Information  |                         |                                      |                                |                      |              |
| ELT Installed? No  | ELT Operated?           | ELT Aided in Locating Accident Site? |                                |                      |              |
| <b>Owner/Operator Information</b>  |                         |                                      |                                |                      |              |
| Registered Aircraft Owner  |                         | Street Address                       |                                |                      |              |
| DELTA AIR LINES, INC.  |                         | HARTSFIELD INTERNATIONAL ARPT.       |                                |                      |              |
|  |                         | City                                 | State                          | Zip Code             |              |
|  |                         | ATLANTA                              | GA                             | 30320                |              |
| Operator of Aircraft   |                         | Street Address                       |                                |                      |              |
| Same as Reg'd Aircraft Owner   |                         | Same as Reg'd Aircraft Owner         |                                |                      |              |
|  |                         | City                                 | State                          | Zip Code             |              |
|  |                         |                                      |                                |                      |              |
| Operator Does Business As: DELTA AIR LINES   |                         |                                      | Operator Designator Code: DALA |                      |              |
| - Type of U.S. Certificate(s) Held:  |                         |                                      |                                |                      |              |
| Air Carrier Operating Certificate(s): Flag Carrier/Domestic  |                         |                                      |                                |                      |              |
| Operating Certificate:   |                         |                                      | Operator Certificate:          |                      |              |
| Regulation Flight Conducted Under: Part 121: Air Carrier   |                         |                                      |                                |                      |              |
| Type of Flight Operation Conducted: Scheduled; Domestic; Passenger Only  |                         |                                      |                                |                      |              |

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|  | Occurrence Date: 11/11/1998 |
|  | Occurrence Type: Accident   |

**First Pilot Information**

|                 |                 |                  |                          |           |
|-----------------|-----------------|------------------|--------------------------|-----------|
| Name<br>On File | City<br>On File | State<br>On File | Date of Birth<br>On File | Age<br>56 |
|-----------------|-----------------|------------------|--------------------------|-----------|

|        |                     |                                      |                             |
|--------|---------------------|--------------------------------------|-----------------------------|
| Sex: M | Seat Occupied: Left | Principal Profession: Civilian Pilot | Certificate Number: On File |
|--------|---------------------|--------------------------------------|-----------------------------|

Certificate(s): Airline Transport; Commercial; Flight Engineer

Airplane Rating(s): Multi-engine Land; Single-engine Land

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Airplane

Instructor Rating(s): None

|   |                                 |
|---|---------------------------------|
| Type Rating/Endorsement for Accident/Incident Aircraft? Yes | Current Biennial Flight Review? |
|---|---------------------------------|

|                        |  |                                    |
|------------------------|--|------------------------------------|
| Medical Cert.: Class 1 | Medical Cert. Status: Valid Medical--w/ waivers/lim. | Date of Last Medical Exam: 07/1998 |
|------------------------|--|------------------------------------|

| - Flight Time Matrix  | All A/C | This Make and Model | Airplane Single Engine | Airplane Multi-Engine | Night | Instrument |           | Rotorcraft | Glider | Lighter Than Air |
|-----------------------|---------|---------------------|------------------------|-----------------------|-------|------------|-----------|------------|--------|------------------|
|                       |         |                     |                        |                       |       | Actual     | Simulated |            |        |                  |
| Total Time            | 10000   | 4082                |                        |                       |       |            |           |            |        |                  |
| Pilot In Command(PIC) |         |                     |                        |                       |       |            |           |            |        |                  |
| Instructor            |         |                     |                        |                       |       |            |           |            |        |                  |
| Last 90 Days          |         | 241                 |                        |                       |       |            |           |            |        |                  |
| Last 30 Days          |         |                     |                        |                       |       |            |           |            |        |                  |
| Last 24 Hours         |         | 8                   |                        |                       |       |            |           |            |        |                  |

|                    |                            |                          |                   |
|--------------------|----------------------------|--------------------------|-------------------|
| Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? No | Second Pilot? Yes |
|--------------------|----------------------------|--------------------------|-------------------|

**Flight Plan/Itinerary**

Type of Flight Plan Filed: IFR

|                               |             |                           |                        |                  |
|-------------------------------|-------------|---------------------------|------------------------|------------------|
| Departure Point<br>CINCINNATI | State<br>OH | Airport Identifier<br>CVG | Departure Time<br>0940 | Time Zone<br>CST |
|-------------------------------|-------------|---------------------------|------------------------|------------------|

|   |       |                           |  |
|---|-------|---------------------------|--|
| Destination<br>Same as Accident/Incident Location | State | Airport Identifier<br>PDX |  |
|---|-------|---------------------------|--|


Type of Clearance: IFR

Type of Airspace: Class D

**Weather Information**

Source of Briefing: Company

Method of Briefing:

|  |                             |
|--|-----------------------------|
|  <p><b>National Transportation Safety Board</b><br/><b>FACTUAL REPORT</b><br/><b>AVIATION</b></p> | NTSB ID: SEA99LA014         |
|  | Occurrence Date: 11/11/1998 |
|  | Occurrence Type: Accident   |

|                                       |                       |  |               |                                 |                              |
|---------------------------------------|-----------------------|--|---------------|---------------------------------|------------------------------|
| <b>Weather Information</b>            |                       |  |               |                                 |                              |
| WOF ID                                | Observation Time      | Time Zone  | WOF Elevation | WOF Distance From Accident Site | Direction From Accident Site |
| KPD                                   | 1156                  | PST  | 20 Ft. MSL    | 1 NM                            | 0 Deg. Mag.                  |
| Sky/Lowest Cloud Condition: Scattered |                       |  | 3500 Ft. AGL  | Condition of Light: Day         |                              |
| Lowest Ceiling: Broken                |                       | 6500 Ft. AGL   |               | Visibility: 10 SM               | Altimeter: 30.00 "Hg         |
| Temperature: 8 °C                     | Dew Point: 6 °C       | Wind Direction: 140                                    |               | Density Altitude: Ft.           |                              |
| Wind Speed: 4                         | Gusts:                | Weather Conditions at Accident Site: Visual Conditions |               |                                 |                              |
| Visibility (RVR): 0 Ft.               | Visibility (RVV) 0 SM | Intensity of Precipitation: Unknown                    |               |                                 |                              |
| Restrictions to Visibility: None      |                       |  |               |                                 |                              |
| Type of Precipitation: None           |                       |  |               |                                 |                              |

|                              |                     |                          |
|------------------------------|---------------------|--------------------------|
| <b>Accident Information</b>  |                     |                          |
| Aircraft Damage: Substantial | Aircraft Fire: None | Aircraft Explosion: None |

|   |       |         |       |      |       |
|---|-------|---------|-------|------|-------|
| Classification: U.S. Registered/U.S. Soil |       |         |       |      |       |
| - Injury Summary Matrix                   | Fatal | Serious | Minor | None | TOTAL |
| First Pilot                               |       |         |       | 1    | 1     |
| Second Pilot                              |       |         |       | 1    | 1     |
| Student Pilot                             |       |         |       |      |       |
| Flight Instructor                         |       |         |       |      |       |
| Check Pilot                               |       |         |       |      |       |
| Flight Engineer                           |       |         |       |      |       |
| Cabin Attendants                          |       |         |       | 9    | 9     |
| Other Crew                                |       |         |       |      |       |
| Passengers                                |       |         |       | 113  | 113   |
| - TOTAL ABOARD -                          |       |         |       | 124  | 124   |
| Other Ground                              | 0     | 0       | 0     |      | 0     |
| - GRAND TOTAL -                           | 0     | 0       | 0     | 124  | 124   |

National Transportation Safety Board

**FACTUAL REPORT**

**AVIATION**



NTSB ID: SEA99LA014

Occurrence Date: 11/11/1998

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

ORRIN K. ANDERSON

Additional Persons Participating in This Accident/Incident Investigation:

RON HOLLOWAY  
PORTLAND FSDO  
HILLSBORO, OR