
Uncommanded rudder oscillation, McDonnell-Douglas DC-10-40, July 10, 1993

Micro-summary: This McDonnell Douglas DC-10-40 experienced an uncommanded rudder oscillation while climbing through 20,000'.


Event Date: 1993-07-10 at 1900 EDT

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

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

Cautions:

1. Accident reports can be and sometimes are revised. Be sure to consult the investigative agency for the latest version before basing anything significant on content (e.g., thesis, research, etc).
 2. Readers are advised that each report is a glimpse of events at specific points in time. While broad themes permeate the causal events leading up to crashes, and we can learn from those, the specific regulatory and technological environments can and do change. ***Your company's flight operations manual is the final authority as to the safe operation of your aircraft!***
 3. Reports may or may not represent reality. Many many non-scientific factors go into an investigation, including the magnitude of the event, the experience of the investigator, the political climate, relationship with the regulatory authority, technological and recovery capabilities, etc. It is recommended that the reader review all reports analytically. Even a "bad" report can be a very useful launching point for learning.
 4. Contact us before reproducing or redistributing a report from this anthology. Individual countries have very differing views on copyright! We can advise you on the steps to follow.
-

| | | | | | |
|--|--|---------------------------------|----------------------------------|--------------------------------------|------------------|
|  | | NTSB ID: CHI93IA248 | | Aircraft Registration Number: N158US | |
| | | Occurrence Date: 07/10/1993 | | Most Critical Injury: None | |
| | | Occurrence Type: Incident | | Investigated By: NTSB | |
| Location/Time | | | | | |
| Nearest City/Place DETROIT | | State MI | Zip Code 48242 | Local Time 1900 | Time Zone EDT |
| Airport Proximity: Unknown | | Distance From Landing Facility: | | Direction From Airport: | |
| Aircraft Information Summary | | | | | |
| Aircraft Manufacturer MCDONNELL DOUGLAS | | Model/Series DC-10-40 | | Type of Aircraft Airplane | |
| Sightseeing Flight: No | | | Air Medical Transport Flight: No | | |
| Narrative | | | | | |
| <p>Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:</p> <p>On July 10, 1993, about 1900 eastern daylight time, a McDonnell Douglas DC-10-40, N158US, registered to and operated by Northwest Airlines, Inc., as Flight 48, experienced an uncommanded rudder oscillation while climbing through 20,000 feet (mean sea level). The anomaly was corrected when the crew disconnected the number one inertial navigation system (INS). The airplane returned to Detroit, Michigan, where it landed without incident. The flight crew of three, cabin crew of eight, and 92 passengers reported no injuries. The airplane sustained no damage. The 14 CFR Part 121 flight was a domestic flight operating between Detroit, Michigan, and Boston, Massachusetts. The flight was on an IFR flight plan; however, VFR conditions existed at Detroit, Michigan. The flight departed at 1842 and returned at 1930.</p> <p>The airplane was examined by the NTSB, FAA, and Northwest Airlines personnel in Detroit on July 11, 1993. The #1 INS display unit and the Captain's attitude indicator were replaced. The cockpit voice recorder (CVR) and flight data recorder (FDR) were removed and taken to the NTSB laboratories in Washington, DC for readout.</p> <p>A review of the airplane's design indicated that the #1 INS provides bank angle information to the yaw flight guidance computer through the attitude monitoring and switching unit. The bank angle information is then transmitted from the yaw flight guidance computer to the lower rudder hydraulic actuator to move the rudder.</p> <p>On July 11, 1993, while the airplane was at Northwest maintenance facilities in Detroit, MI, the examination of the #1 INS began with a cockpit test to identify fault codes recorded in the INS. Fault codes were recorded consistent with a #1 INS failure. The #2 INS and standby INS were examined and both appeared to be operational.</p> <p>The airplane's hydraulic systems were powered via the APU. All flight controls were operated with no anomalies. The yaw damper system self-test was completed with no anomalies. Following the tests and examinations, the #1 INS and controller were removed along with the Captain's ADI. These components were sent to Northwest Airlines facilities for further evaluation. Following a preflight inspection, the airplane was flight tested by Northwest Airlines flight crew. The flight test involved extensive maneuvering of the airplane and a thorough operation of all flight control systems and INS operations. The flight was accomplished successfully.</p> <p>On or about July 16, 1993, bench testing of the #1 INS, by Northwest personnel, indicated that the internal gyro generating bank-axis (lateral) reference information had failed. The gyro output varied as the gyro tumbled, which produced a bank angle signal. The INS warning light that illuminated on the unit during the incident event correctly identified a failure of the unit. Northwest Airlines personnel reported that testing verified there were no anomalies with the Captain's ADI.</p> | | | | | |
| FACTUAL REPORT - AVIATION | | | | | |
| Page 1 | | | | | |

National Transportation Safety Board

**FACTUAL REPORT
AVIATION**




NTSB ID: CHI93IA248


Occurrence Date: 07/10/1993

Occurrence Type: Incident

Narrative (Continued)

The Digital Flight Data Recorder Factual Report is attached as an addendum to this report.

| | | | | | |
|--|------------------------------------|--|------------------------------------|------------------------|--------------|
|  National Transportation Safety Board FACTUAL REPORT AVIATION | | NTSB ID: CHI93IA248 | | | |
| | | Occurrence Date: 07/10/1993 | | | |
| | | Occurrence Type: Incident | | | |
| Landing Facility/Approach Information | | | | | |
| Airport Name | Airport ID: | Airport Elevation Ft. MSL | Runway Used 0 | Runway Length | Runway Width |
| Runway Surface Type: | | | | | |
| Runway Surface Condition: | | | | | |
| Type Instrument Approach: | | | | | |
| VFR Approach/Landing: | | | | | |
| Aircraft Information | | | | | |
| Aircraft Manufacturer MCDONNELL DOUGLAS | | Model/Series DC-10-40 | | Serial Number 46767 | |
| Airworthiness Certificate(s): Transport | | | | | |
| Landing Gear Type: Retractable - Tricycle | | | | | |
| Homebuilt Aircraft? No | Number of Seats: 294 | Certified Max Gross Wt. | 583000 LBS | Number of Engines: 3 | |
| Engine Type: Turbo Fan | Engine Manufacturer: P&W | Model/Series: JT9D-20J | Rated Power: 40000 LBS | | |
| - Aircraft Inspection Information | | | | | |
| Type of Last Inspection AAIP | Date of Last Inspection 11/1992 | Time Since Last Inspection 3081 Hours | Airframe Total Time 49826 Hours | | |
| - Emergency Locator Transmitter (ELT) Information | | | | | |
| ELT Installed? No | ELT Operated? | ELT Aided in Locating Accident Site? | | | |
| Owner/Operator Information | | | | | |
| Registered Aircraft Owner NORTHWEST AIRLINES, INC. | | Street Address 5101 NORTHWEST DR., SEPT C5000 | | | |
| | | City SAINT PAUL | State MN | Zip Code 55111 | |
| Operator of Aircraft Same as Reg'd Aircraft Owner | | Street Address Same as Reg'd Aircraft Owner | | | |
| | | City | State N | Zip Code | |
| Operator Does Business As: | | | Operator Designator Code: NWAA | | |
| - 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/Cargo | | | | | |
| FACTUAL REPORT - AVIATION | | | | | |

| | |
|--|-----------------------------|
|  <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p> | NTSB ID: CHI93IA248 |
| | Occurrence Date: 07/10/1993 |
| | Occurrence Type: Incident |

First Pilot Information

| | | | | |
|-----------------|-----------------|------------------|--------------------------|-----------|
| Name On File | City On File | State On File | Date of Birth On File | Age 52 |
|-----------------|-----------------|------------------|--------------------------|-----------|

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

Certificate(s): Airline Transport

Airplane Rating(s): Multi-engine Land

Rotorcraft/Glider/LTA: None

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: Unknown | Date of Last Medical Exam: 04/1993 |
|------------------------|-------------------------------|------------------------------------|

| - 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 | 15901 | 1045 | | | | | | | | |
| Pilot In Command(PIC) | | | | | | | | | | |
| Instructor | | | | | | | | | | |
| Last 90 Days | | 151 | | | | | | | | |
| Last 30 Days | | | | | | | | | | |
| Last 24 Hours | | 12 | | | | | | | | |

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

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

| | | | | |
|---|-------|--------------------|------------------------|------------------|
| Departure Point Same as Accident/Incident Location | State | Airport Identifier | Departure Time 1842 | Time Zone EDT |
|---|-------|--------------------|------------------------|------------------|

| | | | |
|-----------------------|-------------|---------------------------|--|
| Destination BOSTON | State MA | Airport Identifier BOS | |
|-----------------------|-------------|---------------------------|--|


Type of Clearance: IFR

Type of Airspace: Class B; Class E

Weather Information

Source of Briefing: Commercial Weather Service

Method of Briefing:

| | |
|--|-----------------------------|
|  <p>National Transportation Safety Board FACTUAL REPORT AVIATION</p> | NTSB ID: CHI93IA248 |
| | Occurrence Date: 07/10/1993 |
| | Occurrence Type: Incident |

| | | | | | |
|---------------------------------------|-----------------------|--|---------------|---------------------------------|------------------------------|
| Weather Information | | | | | |
| WOF ID | Observation Time | Time Zone | WOF Elevation | WOF Distance From Accident Site | Direction From Accident Site |
| DTW | 1853 | EDT | 639 Ft. MSL | 0 NM | 0 Deg. Mag. |
| Sky/Lowest Cloud Condition: Scattered | | | 4300 Ft. AGL | Condition of Light: Day | |
| Lowest Ceiling: None | | 0 Ft. AGL | | Visibility: 20 SM | Altimeter: 30.00 "Hg |
| Temperature: 29 °C | Dew Point: 22 °C | Wind Direction: 240 | | Density Altitude: Ft. | |
| Wind Speed: 10 | 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 | | | | | |

| | | |
|-----------------------------|---------------------|--------------------------|
| Accident Information | | |
| Aircraft Damage: None | 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 | | | | 1 | 1 |
| Cabin Attendants | | | | 8 | 8 |
| Other Crew | | | | | |
| Passengers | | | | 92 | 92 |
| - TOTAL ABOARD - | | | | 103 | 103 |
| Other Ground | 0 | 0 | 0 | | 0 |
| - GRAND TOTAL - | 0 | 0 | 0 | 103 | 103 |

National Transportation Safety Board

FACTUAL REPORT

AVIATION



NTSB ID: CHI93IA248

Occurrence Date: 07/10/1993

Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

STEPHEN A. WILSON

Additional Persons Participating in This Accident/Incident Investigation:

GERALD BUIT
FAA-AGL-DTW-FSDO
DETROIT, MI