

National Transportation Safety Board  
Washington, DC 20594

Brief of Incident

Adopted 09/21/2009

CHI08IA182

File No. 25699

07/07/2008

St. Louis, MO

Aircraft Reg No. N804ME

Time (Local): 08:45 CDT

Make/Model: McDonnell Douglas / MD-81

Fatal      Serious      Minor/None

Engine Make/Model: Pratt & Whitney / JT8D-217C

Crew      0      0      8

Aircraft Damage: Minor

Pass      0      0      43

Number of Engines: 2

Operating Certificate(s): Flag Carrier/Domestic

Name of Carrier: Midwest Airlines, Inc.

Type of Flight Operation: Non-scheduled; Domestic; Passenger Only

Reg. Flight Conducted Under: Part 121: Air Carrier

Last Depart. Point: Chicago, IL

Condition of Light: Day

Destination: Charlotte, NC

Weather Info Src: Weather Observation Facility

Airport Proximity: On Airport/Airstrip

Basic Weather: Visual Conditions

Airport Name: Chicago Midway International

Lowest Ceiling: 15000 Ft. AGL, Broken

Runway Identification: 31C

Visibility: 10.00 SM

Runway Length/Width (Ft): 6522 / 150

Wind Dir/Speed: 230 / 010 Kts

Runway Surface: Concrete

Temperature (°C): 26

Runway Surface Condition: Dry

No Obscuration; Moderate - In

Pilot-in-Command Age: 50

the Vicinity -

Precip/Obscuration:

Showers - Rain

Flight Time (Hours)

Total All Aircraft: 15014

Certificate(s)/Rating(s)

Airline Transport; Multi-engine Land; Single-engine Land

Last 90 Days: 200

Instrument Ratings

Total Make/Model: Unk/Nr

Airplane

Total Instrument Time: UnK/Nr

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## HISTORY OF FLIGHT

On July 7, 2008, at approximately 0845 central daylight time, a McDonnell Douglas MD-81, N804ME, operated as Midwest Airlines Flight 8663, experienced a tailcone evacuation slide inflation shortly after takeoff from Chicago Midway International Airport (KMDW), Chicago, Illinois. Visual meteorological conditions prevailed at the time of the event. The charter flight was operating under the provisions of 14 Code of Federal Regulations (CFR) Part 121 on an instrument flight plan. There were no injuries to the 2 flight crew members, 4 flight attendants, 2 airline representatives, and 43 passengers. The flight was en route to Charlotte-Douglas International Airport (KCLT), Charlotte, North Carolina, when the evacuation slide inflated. The airplane diverted to Lambert-St. Louis International Airport (KSTL), St. Louis, Missouri, and made an uneventful landing at 0930.

Flight crew statements indicated that they did not hear the slide inflate in flight, nor did an airline mechanic who was seated in the rear of the airplane. The captain reported that after liftoff the airplane's pitch continued to increase without a corresponding flight control input. The airplane's pitch reached 20-25

degrees nose up before he regained control using control column and stabilizer pitch trim inputs. The flight crew noted that the pitch control pressure required to level the airplane was "higher than normal."

After the incident, the flight crew consulted with the airline's maintenance staff, in addition to completing the abnormal checklist procedures. The corrective actions taken by the flight crew were ineffective in reducing or eliminating the restriction in the pitch control system. Consequently, they elected to divert to KSTL instead of continuing to KCLT. The captain noted that normal flight control pressures returned during cruise descent, as the airplane passed through 15,000 feet mean sea level (msl). According to the flight crew, no additional flight control restrictions or anomalies were encountered during the remainder of the flight.

## PERSONNEL INFORMATION

According to Federal Aviation Administration (FAA) records, the captain, age 50, held an airline transport pilot certificate with airplane single and multiengine land ratings. The airplane single-engine land rating was limited to commercial privileges only. He also held a flight instructor certificate with single and multi-engine airplane, and instrument airplane ratings. He was type-rated in the Cessna Citation, Learjet, and McDonnell Douglas DC-9 airplanes. His last aviation medical examination was completed on June 18, 2008, when he was issued a first-class medical certificate with the limitation that he have corrective lenses available for near vision. At the time of the medical examination, the pilot reported having 15,014 hours of flight experience. A search of FAA records showed no accident, incident, enforcement or disciplinary actions.

The airline hired the captain on January 3, 1990, to fly variants of the Douglas DC-9, McDonnell Douglas MD-80, and Boeing 717 airplanes. He had flown 850 hours during the previous 12 months, 413 hours during the prior 6 months, 200 hours during the past 90 days, and 60 hours during previous month. He had flown about 0.4 hours during the 24 hour period before the incident flight. His last regulatory checkride was completed on June 9, 2008, in the same make/model as the incident airplane.

According to FAA records, the first officer, age 42, held an airline transport pilot certificate with airplane single and multiengine land ratings. The airplane single-engine land rating was limited to commercial privileges only. He also held a flight instructor certificate with single and multi-engine airplane, and instrument airplane ratings. He was type-rated in the McDonnell Douglas DC-9, Gulfstream G-IV, Learjet model 60, Saab-Fairchild model 340, and Boeing models 737, 757, and 767 airplanes. His last aviation medical examination was completed on September 28, 2007, when he was issued a first-class medical certificate with no restrictions or limitations. At the time of the medical examination, the pilot reported having 6,400 hours of flight experience. A search of FAA records showed no accident, incident, enforcement or disciplinary actions.

The airline hired the first officer on August 21, 2000, to fly variants of the Douglas DC-9, McDonnell Douglas MD-80, and Boeing 717 airplanes. He had flown 603 hours during the previous 12 months, 282 hours during the prior 6 months, 148 hours during the past 90 days, and 47 hours during previous month. He had flown about 0.4 hours during the 24 hour period before the incident flight. His last regulatory checkride was completed on August 13, 2007, in the same make/model as the incident airplane.

## AIRCRAFT INFORMATION

The MD-81 is a low-wing, twin engine, 14 CFR Part 25 certified transport-category airplane. The MD-81, which the FAA certified in 1981, was derived from earlier DC-9 models. As a result, much of the MD-81's structure and many of its systems, components, and installations are similar to earlier DC-9 models. According to Boeing, the first DC-9 airplane entered service in December 1965; the final DC-9 airplane entered service in October 1982. The MD-80 series, including the MD-81,-82,-83,-87 and -88 were in production through 1999. The DC-9 family of airplanes also includes the McDonnell Douglas MD-90 and Boeing 717 series airplanes.

The incident airplane, N804ME, an MD-81, serial number (s/n) 48030, was manufactured in 1981 and was registered to Midwest Airlines on September 23, 1998. The airplane was added to the airline's operating certificate on April 23, 1999. According to airline records, the airplane had accumulated about 46,844 total hours of operation at the time of the incident. The airplane was configured for charter operations and seated a maximum of 82 passengers, in addition to the 2 flight crew and 5 cabin crew members.

The incident airplane was equipped with two Pratt & Whitney JT8D-217C turbofan engines, each producing 20,000 lbs of thrust. Airline records indicated that the left engine, s/n 725625, had operated about 28,089 hours since new and 18,447 hours since its last overhaul. The right engine, s/n 718459, had operated about 34,384 hours since new and 8,528 hours since its last overhaul.

The airplane's tailcone is attached to the aft end of the fuselage and can be jettisoned to provide an opening for an emergency exit. This exit is accessible from the passenger compartment through the aft bulkhead pressure door and aft accessory compartment. The tailcone can be released either from inside or outside the aircraft. A mechanism is integrated into the aft bulkhead door, that when armed will jettison the tailcone and initiate the evacuation slide deployment. The tailcone falls away from the aft fuselage, and an attached lanyard pulls open the evacuation slide cover. This in turn rotates the slide pack aft and a second lanyard triggers the inflation cylinder which inflates the slide.

The tailcone evacuation slide (p/n 100503-117 Rev. J, s/n PAI058) was installed on December 10, 2007. Since its installation, no logbook discrepancies were noted for the evacuation slide. The airline's maintenance program called for a general visual inspection (service check) of the tailcone evacuation slide area every 99 flight hours. The last service check occurred on June 5, 2008, at which time no anomalies were noted with the slide installation. A less frequent operations (phase) check of the inflation cylinder pressure was last completed on June 20, 2008, without any significant findings.

#### METEOROLOGICAL INFORMATION

The closest weather station to the incident site was at the departure airport. The Chicago Midway International Airport (KMDW) was equipped with an automated surface observing system (ASOS).

At 0851, the KMDW ASOS reported the following weather conditions: Wind 230 degrees true at 10 knots, gusting 15 knots; visibility 10 miles; scattered clouds at 8,500 feet above ground level (agl), broken ceilings at 15,000 and 20,000 feet agl, and an overcast ceiling at 25,000 feet agl; temperature 26 degrees Celsius; dew point 21 degrees Celsius; altimeter setting 29.95 inches of mercury. The weather report indicated there were moderate rain showers in the distant west.

#### FLIGHT RECORDERS

The incident airplane was equipped with a Fairchild Model A100S Cockpit Voice Recorder (CVR), s/n 00781U. The CVR showed no signs of damage and was sent to the Safety Board's laboratory in Washington, DC, for readout and evaluation. The CVR did not contain any relevant data from the incident flight and was not transcribed.

The incident airplane was equipped with an L-3 Communications Fairchild Model F1000 Flight Data Recorder (FDR), s/n 00442, which recorded airplane flight information in a digital format using solid-state memory. The FDR showed no evidence of damage after removal from the incident airplane and was sent to the Safety Board's laboratory for readout and evaluation.

On the incident flight, the maximum pitch angle during initial rotation was 16.3 degrees with a maximum pitch rate of 3.5 degrees per second and an average

pitch rate of 1.4 degrees per second. The maximum pitch seen during the takeoff and initial climb was 26.8 degrees. According to Boeing, typical pitch angles during initial climb are between 16-20 degrees, with occasional flights reaching 25 degrees. Typical rotation rates are approximately 3 degrees per second.

Inertial calculations were performed using FDR data from the incident flight in order to determine if the airplane encountered sufficient accelerations to have allowed an unsecured slide container to rotate open about its hinge line. The results indicated that during takeoff rotation and initial climb there were inertial loads of sufficient magnitude and duration to allow an unsecured slide cover to rotate open and initiate slide inflation. Prior to the incident flight, the airplane had flown 15 flight legs since the last service check of the tailcone evacuation slide. The same inertial calculations for rotation and initial climb indicated that the airplane had experienced loads of similar magnitude, but were of insufficient duration to result in slide inflation.

## WRECKAGE AND IMPACT INFORMATION

Post-flight inspection of the airplane confirmed an in-flight inflation of the evacuation slide within the tailcone. Upon arrival on-scene, Safety Board investigators found the deflated slide lying in and around its cover. The slide cover was overturned immediately aft of its normal location at the end of the walkway. The slide's inflation cylinder was empty and lying inside the slide cover. The slide cover and base, including the hinges, forward tie-down straps, deployment lanyard assembly, and floor mounting hardware were undamaged. A bracket that secured one of the walkway railings to an overhead structural support had fractured. The unsecured railing and an inflated slide may have impinged on a set of elevator control cables that ran vertically in close proximity to the railing.

## TESTS AND RESEARCH

The slide and its associated hardware were removed from the airplane and shipped to the slide manufacturer for further examination and testing under the direct supervision of the NTSB.

The incident slide was inflated for a visual inspection. There was one BB-sized (0.177 inch diameter) hole in the left support tube with a 6-inch scrape leading to the hole. Dark linear markings of a grease-like material were noted on the right tube of the slide consistent with contact to the elevator control cables. The inflation system components (lanyard, inflation cylinder, and inflation valve) were within design specifications. Alignment of the inflation valve trigger was rotated approximately 30 degrees from its nominal position. However, per the slide manufacturer, this position would not have affected the initiation of slide inflation. Examination of the slide did not reveal any anomalies that would have prevented its normal deployment.

Two deployment tests were conducted using an exemplar slide and slide cover. The first test simulated a properly installed slide, with the forward tie-down straps/brackets engaged to the floor fittings. Upon activation of the slide, the slide expanded internally and caused the base of the slide cover to deform upward. Both forward tie-down straps remained attached to their respective floor fittings and were taut. The slide cover did not rotate open. The slide pack contained air and was noticeably larger, but the valise had not been breached.

The second test simulated a slide with the forward tie-down straps left unsecured. When the inflation lanyard was released, the slide began to inflate and the slide cover immediately rotated on its aft hinge allowing the slide to expand, separate its primary restraint, and fully extend.

Examination showed that the slide must rotate about 90 degrees from its normal resting position to activate its inflation cylinder. The slide cover also released from its hinges as designed at a similar angle. A properly secured slide cover would not have allowed the slide to rotate enough to activate its inflation cylinder.

A pull force test was performed to determine how much force was required to release the floor retention brackets. The tailcone release lanyard was pulled in a

direction similar to that which occurs during a normal slide deployment. The retention brackets yielded at a combined force of 22.8 lbs. According to Boeing, a functional test of the retention brackets is required at manufacture; however, there is no specific pull force requirement.

## ADDITIONAL DATA/INFORMATION

The incident flight was a charter operation for a political candidate, his staff, reporters, and United States Secret Service (USSS) personnel. Since the last service check of the evacuation slide, the incident airplane had flown 3 flight legs with the political candidate aboard. The results of an internal USSS investigation relating to the security sweeps of the incident aircraft revealed that no USSS personnel or USSS support personnel interfered with or altered the aircraft's hardware or systems relating to the tailcone evacuation slide.

After the incident, the airline inspected their 11 airplane MD-80 fleet as scheduled. The inspections were performed between July 11 and July 25, 2008. No anomalies with the tailcone evacuation slides were noted during the inspections.

A query of the FAA's Service Difficulty Reporting (SDR) system found one similar incident on an MD-81 in September 1991. According to the report, the captain reported the flight controls were stiff during a preflight inspection. Upon examination, maintenance personnel found the tailcone evacuation slide inflated within the tailcone without the aft bulkhead door being armed/activated. Further investigation could not decisively determine the cause of the inadvertent slide inflation. In the event, none of the slide components, including the slide cover, were damaged during the inflation. All of the related systems were properly rigged. The operator suspected the cause of the inadvertent slide inflation was due to an inadequately restrained evacuation slide cover.

According to Boeing, only one similar incident, occurring in July 2002, had been reported to the company. The incident involved an MD-82 operator that experienced an in-flight tailcone evacuation slide inflation after encountering severe turbulence. The tailcone remained attached to the aft-fuselage. The slide was subsequently punctured when it impinged on adjacent structure. The operator reported that one of the forward tie-down straps was torn from the evacuation slide cover. The slide cover hinge sustained minor damage. The slide cover was repaired and returned to service before Boeing had an opportunity to examine the components.

On October 8, 2008, the airline released Maintenance Alert Bulletin #10-08 describing the incident and findings from the investigation. The bulletin also noted that an additional step would be added to the MD-80 Service Check to ensure the security of the slide cover tie-down straps. On October 14, 2008, the airline released a revision to the work card for the general visual inspection (service check), which added specific language calling for an examination of the tie-down straps to ensure their proper installation and security.

The National Transportation Safety Board determines the probable cause(s) of this incident as follows.

The inadvertent partial inflation of the evacuation slide within the tailcone during takeoff and subsequent binding of the elevator control cables. The partial inflation resulted from the tailcone evacuation slide cover failing to be secured to the floor fittings on the walkway for undetermined reasons.