
Loss of main wheel, Douglas DC-9-51, October 14, 1999

Micro-summary: This Douglas DC-9-51 sustained a left outboard main wheel and tire assembly separation on takeoff, damaging structures on the ground.


Event Date: 1999-10-14 at 1355 CDT

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

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

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		NTSB ID: CHI00IA009		Aircraft Registration Number: N766NC	
		Occurrence Date: 10/14/1999		Most Critical Injury: None	
		Occurrence Type: Incident		Investigated By: NTSB	
Location/Time					
Nearest City/Place CHICAGO		State IL	Zip Code 60638	Local Time 1355	Time Zone CDT
Airport Proximity: On Airport		Distance From Landing Facility:		Direction From Airport:	
Aircraft Information Summary					
Aircraft Manufacturer McDonnell Douglas		Model/Series DC-9-51		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 October 14, 1999, about 1355 central daylight time, a McDonnell Douglas DC-9-51, N766NC, operated as Northwest Airlines (NWA) flight #1412 to Detroit, Michigan, piloted by an airline transport rated Captain and an airline transport rated First Officer, sustained a left outboard main (#1 main) wheel and tire assembly separation on takeoff from runway 22L at Chicago Midway Airport (MDW), Chicago, Illinois. The left inboard main (#2 main) wheel and tire assembly remained attached. The 14 CFR Part 121 commercial flight operated on an IFR flight plan. Visual meteorological conditions prevailed at the time of the incident. The 2 flight crewmembers, 1 person in the cockpit jumpseat, 4 flight attendants, and 98 passengers were uninjured. The airplane's separated wheel and tire assembly impacted, damaged, and dislodged panels that make up MDW's southwest perimeter wall. That wheel and tire assembly also impacted a vehicle westbound on 63rd Street. The dislodged perimeter wall panels impacted another westbound vehicle on 63rd Street. The driver of the first vehicle was taken to the hospital for observation. The driver and two occupants of the second vehicle reported no injuries. The flight originated at the time of the incident and landed at Detroit Metropolitan Wayne County Airport, near Detroit, Michigan about 1604 eastern daylight time without further incident.</p> <p>An on-scene inspection revealed an impact mark consistent with the inboard cone bearing deformed cage's shape and roller bearing spacing, on the threshold bar marking defining the start of runway 4R's usable runway. The impact mark was five feet northwest of runway 4R's centerline. The bearing's race, marked with part number (p/n) 71450, was found 308 feet southwest of runway 4R's threshold. The bearing's cage was found 373 feet southwest of runway 4R's threshold. Twenty-three tapered roller bearings were found spread on the runway's prepared surface up to 360 feet southwest of the cage's location. The bearing components were found coated with a grease like substance and revealed no pre-impact anomalies. See appended wreckage diagram.</p> <p>An impression, approximately 26 feet long, was found in the grass area between 4R's prepared surface and a service road that parallels 63rd Street. The heading of the impression was 215 degrees. That impression heading led to the airport's perimeter wall. In line with that impression was a channeled fence post. The post was found dislodged from its frangible coupling at its base. Two wall panels were found dislodged from their channels.</p> <p>A vehicle, which traveled westbound on 63rd Street, was found with dents on its passenger side front quarter panel, hood, front bumper, and on its passenger side rear quarter panel. The front and the rear impression damage areas were semi-circular in shape.</p> <p>An airport incident report showed that a second vehicle, which also traveled westbound on 63rd Street, was found with damage to its front bumper from a section of the airport's perimeter wall.</p> <p>A tire and wheel assembly, p/n 956-0859 marked serial number (s/n) 00895, was found resting south of 63rd Street's eastbound lanes. The tire exhibited discoloration from substances transferred to</p>					
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its surface. The tire had abrasions on its outboard surface and abrasions and cuts on its inboard surface. The tire was found pressurized and was deflated for safety. The assembly's hubcap was found intact. The hubcap was removed which revealed a yellow colored axle nut, in-place, and safety wired. The axle nut held an axle nut spacer/retainer in-place. The safety wire had to be cut to free the spacer/retainer. The inboard flat surface of the axle nut was found distorted with areas having a polished appearance. The spacer/retainer, marked EM3241-01048/SB32-228, was found in-place. The spacer/retainer was found holding the outboard cone bearing grease seal's tangs in its slots. The spacer/retainer anti-rotation pin was found with a groove on its inner surface and the interior surface of the spacer/retainer had areas having a polished appearance. The grease seal and outboard cone bearing were found with no anomalies. The spacer/retainer anti-rotation pin, when engaged inward in the keyway machined into exterior surface of the axle's 9 o'clock position when viewed on end, prevents the rotation of the axle nut by lockscrews fastened to the face of the spacer/retainer.

The airplane was examined upon landing at Detroit Metropolitan Wayne County Airport, near Detroit, Michigan, by Federal Aviation Administration (FAA) inspectors. The examination revealed no damage to the exterior portion of the #1 axle, fuselage, left flap, #1 engine cowl, and to the left fly door. The interior portion of the axle was examined and the internal threads were found intact. The anti-skid transducer adapter was found loosened inside the axle's threads and was found backed out from its specified seated position. The FAA inspector rotated the adapter 4 1/2 turns in a clockwise direction to its correct position. The #1 tire and wheel assembly rolled and rotated in the direction of loosening or counterclockwise rotation while the airplane is in forward motion on the ground. The anti-skid transducer adapter and the axle nut used the axle's same internal threads. A gap was observed in the DC-9's maintenance manual figures between the adapter and the nut when the adapter is installed at its specified position. The axle nut was found to contact the anti-skid transducer adapter when the adapter was backed out to the position it was found in after landing at Detroit.

The airplane's maintenance records were reviewed. The incident tire was changed on October 1, 1999, in Minneapolis, Minnesota. The airplane accumulated 22:45 flight hours and 20 cycles between October 1, 1999, and October 14, 1999.

The two mechanics' statements state that the tire assembly was installed in accordance with maintenance manual 32-40-1.

The Northwest Airlines DC-9 maintenance manual, "Main Gear Wheel and Tire Assembly - Maintenance Practices", 32-40-1 was reviewed. The manual's section 3B directed the wheel and tire installation procedures. This section's 17 installation steps were reviewed and the steps did not note, caution, warn, or list checking the security and depth of the anti-skid transducer adapter within the axle for proper installation.

The manufacturer's maintenance manual 32-40-1 was reviewed along with the United States Air Force's and United States Navy's equivalent DC-9 technical data. The three manuals list 16 installation steps and also did not note, caution, warn, or list checking the security and depth of the anti-skid transducer adapter within the axle for proper installation.

Manufacturer's Service Bulletin (SB) 32-111 states that on DC-9 20, 30, and 40 series airplanes, that the anti-skid transducer was secured through a "lockwire" connection between the anti-skid transducer and the axle nut lockscrew. Manufacturer's Service Bulletin (SB) 32-111 was issued to stop safety wiring the anti-skid transducer to the axle nut lockscrew for an alternative set screw method of securing the transducer's rotation. The reasoning listed in SB 32-111 is "...to reduce the time required to change wheels and tires." This airplane's SB 32-111 modification was incorporated prior to its delivery to the airline.

Subsequent to the incident, the manufacturer issued temporary service bulletins to the affected

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airplane's 32-40-01 maintenance manuals, cautioning mechanics to check the depth dimension of the transducer adapter with reference to the applicable technical data.

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		Occurrence Type: Incident			
Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
CHICAGO MIDWAY AIRPORT	MDW	620 Ft. MSL	22L	6446	150
Runway Surface Type: Concrete					
Runway Surface Condition: Dry					
Type Instrument Approach: NONE					
VFR Approach/Landing:					
Aircraft Information					
Aircraft Manufacturer		Model/Series		Serial Number	
McDonnell Douglas		DC-9-51		47739	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 132	Certified Max Gross Wt.	110000 LBS	Number of Engines: 2	
Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:		
Turbo Jet	P&W	JT8D17H	16000 LBS		
- Aircraft Inspection Information					
Type of Last Inspection		Date of Last Inspection	Time Since Last Inspection	Airframe Total Time	
Continuous Airworthiness		12/1998	1891 Hours	56338 Hours	
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner		Street Address			
NORTHWEST AIRLINES INC.		5101 NORTHWEST DRIVE C7-8960			
		City	State	Zip Code	
		ST PAUL	MN	55111	
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:			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 Only					

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First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 53
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Sex: M	Seat Occupied: Left	Principal Profession: Civilian Pilot	Certificate Number: On File
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Certificate(s): Airline Transport; Flight Engineer

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?
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Medical Cert.: Class 1	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 04/1999
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- 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	6573	3259								
Pilot In Command(PIC)										
Instructor										
Last 90 Days	207									
Last 30 Days										
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? No	Second Pilot? Yes
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Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point Same as Accident/Incident Location	State	Airport Identifier MDW	Departure Time 1355	Time Zone CDT
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Destination DETROIT	State MI	Airport Identifier DTW	
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Type of Clearance: IFR

Type of Airspace: Class C

Weather Information

Source of Briefing:

Method of Briefing:


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Weather Information					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
MDW	1353	CDT	620 Ft. MSL	0 NM	0 Deg. Mag.
Sky/Lowest Cloud Condition: Clear			0 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: None		0 Ft. AGL	Visibility: 10 SM	Altimeter: 30.00	"Hg
Temperature: 14 °C	Dew Point: 2 °C	Wind Direction: 180		Density Altitude: Ft.	
Wind Speed: 8	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					
Cabin Attendants				4	4
Other Crew				1	1
Passengers				98	98
- TOTAL ABOARD -				105	105
Other Ground	0	0	0		0
- GRAND TOTAL -	0	0	0	105	105

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	Occurrence Type: Incident

Administrative Information

Investigator-In-Charge (IIC)

EDWARD F. MALINOWSKI

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