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## Turbulence injury, McDonnell Douglas DC-9-51, January 28, 1997

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**Micro-summary:** This McDonnell Douglas DC-9-51 experienced turbulence while descending, seriously injuring a flight attendant.

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**Event Date:** 1997-01-28 at 0853 CST

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

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

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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!***
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		NTSB ID: CHI97LA060		Aircraft Registration Number: N414EA	
		Occurrence Date: 01/28/1997		Most Critical Injury: Serious	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place CAPE GIRARDEAU		State MO	Zip Code 63701	Local Time 0853	Time Zone CST
Airport Proximity: Off Airport/Airstrip		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					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
HISTORY OF FLIGHT					
<p>On January 28, 1997, at 0853 central standard time (cst), a McDonnell Douglas DC-9-51, N414EA, operated by Trans World Airlines (TWA) as Flight 374, experienced severe clear air turbulence over Cape Girardeau, Missouri, during the initial descent into Lambert International Airport, St. Louis, Missouri. One flight attendant (F/A) was seriously injured, a second flight attendant received minor injuries. The captain, first officer, a third flight attendant, and 107 passengers on board were not injured. The airplane was not damaged. The flight originated from New Orleans, Louisiana, at 0751 cst.</p>					
<p>The First Officer, who was flying the airplane, reported that they were informed to expect FL240 over Cape Girardeau instead of the usual FL280 because it was "bumpy." He stated the seat belt sign was turned on during the descent to FL240. He reported they were then cleared down to FL230. He stated the ride was smooth at FL230 so the seat belt sign was turned off. He reported that after a few minutes they encountered turbulence at which time they turned the seat belt sign back on and made a PA announcement for the passengers to be seated. He stated that it was at this time that the severe turbulence was encountered. The flight crew notified the Kansas City (MKC) Air Route Traffic Control Center (ARTCC) of the turbulence and requested a lower altitude. The Captain reported they checked with the flight attendants to see if anyone was injured. They were informed that one passenger and two flight attendants had sustained injuries. An emergency was declared and Flight 374 was cleared to the St. Louis Lambert International Airport.</p>					
<p>The Captain reported that the turbulence encountered was "intense and the duration was approximately 30 seconds." He reported that they had no warning prior to the encounter and they were in clear air.</p>					
INJURY INFORMATION					
<p>Two of the three flight attendants on board the airplane received injuries. Flight attendant L1 received bruised ribs. Flight attendant C1 received a broken left clavicle, fractured left ribs, strained neck muscles, and bruising.</p>					
<p>Flight attendant L1 reported she was finishing up service when the seat belt sign came on. A passenger came out of the lavatory and it became "moderately turbulent." She reported that the seats were full so she had the passenger get down on the floor and she held on to the passenger. She reported the turbulence quit at which time she and the passenger got up. On the way to the passengers seat she heard someone say "sit down." She reported they once again experienced turbulence and she pushed the passenger onto the floor and yelled for other passengers to hold her down. She stated that she "Flew up and hit the ceiling. I came down and hit my face on the seat, then flew back up and hit the ceiling and came down on the back of a seat with my left side." She</p>					
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National Transportation Safety Board

## FACTUAL REPORT

AVIATION

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Occurrence Type: Accident

## Narrative (Continued)

reported she landed on the floor in between a row of seats. She reported she got up, checked on the passenger she pushed to the floor and took her back to her seat. She then walked through the cabin checking on passengers and saw the C1 flight attendant on the floor in the back galley. She reported he was complaining of shoulder pain. She made another seat belt PA announcement, called the cockpit, got in her jumpseat, and aided the C1 flight attendant. When she was told it was ok to get up, she walked through the cabin to check on passengers, and went to the cockpit to brief the flight crew.

The R1 flight attendant who was in the rear galley reported the seat belt sign was off when one passenger got up to use the lavatory and another got up to look at the magazine rack. He reported the passenger came out of the lavatory and "gentle turbulence" was experienced. He reported the L1 flight attendant held onto the passenger and had her get on the floor. He reported he had the passenger at the magazine rack sit down and secure his seat belt. He reported that the seat belt sign came on and he made a PA announcement for everyone to check and fasten their seat belts. He reported that the turbulence stopped for about a minute. The L1 flight attendant walked the passenger back toward her seat and he went about his duties in the rear galley. He reported, "Then it hit, I went flying to the ceiling, down to the floor on my left side at which time I heard something snap in my shoulder area. ... Then I went up in the air again, hit the ceiling and came down again on my left side." He reported he was lying on the floor when the turbulence stopped and the L1 flight attendant came back and got in her jumpseat. He reported he got up into his jumpseat but was unable to put his restraint on because of the shoulder pain. He reported he felt sick and he told the L1 flight attendant that he had to get back on the floor before he passed out. He reported he got on his knees and crawled to get behind row 24-D/E where he laid down and stayed for the remainder of the flight being aided by the other flight attendants.

The R1 flight attendant, who was not injured, reported he was in the front galley when they hit some "un-expected turbulence" which he described as "very severe." He continued to report, "It lasted about 5 to 10 seconds and stopped. My feet left the floor as I tried to brace myself. A few seconds later we hit very severe turbulence again. This time it lasted a little bit longer and was a little more intense. My feet left the ground again and I hit my head on the ceiling." He reported he got to his jumpseat and after a few minutes received a call from the L1 flight attendant telling him they would assist the passengers once it was safe to get up. The L1 flight attendant also informed him of the injured C1 flight attendant. He reported that once it was safe he went to the back of the airplane and aided the C1 flight attendant.

## METEOROLOGICAL CONDITIONS

At 0755 cdt (1355z), SIGMET Victor 2 was issued which was valid until 1155 cdt (1755Z). The SIGMET was for portions of Missouri, Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia. The area listed in the SIGMET was from Erie, PA; to Slate Run, PA; to Johnstown, PA; to London, KY; to Walnut Ridge, AR; to Springfield, MO; to Ft. Wayne, IN; to Erie, PA. The SIGMET called for moderate occasional severe turbulence between FL240 and FL350 due to windshear involving upper level jetstream. These conditions were reported by a number of aircraft. Conditions were expected to continue beyond 1155 cdt.

At 0930 cdt (1530z), SIGMET Victor 3 was issued for the same area as Victor 2 with the altitude being changed to between FL210 and FL350. This SIGMET contained the comment that injuries were reported by a DC-9 at FL210-FL220, 50 southeast of Farmington, MO. Conditions were expected to continue beyond 1330 cdt.

Numerous PIREPs were received by Air Traffic Control regarding moderate to severe turbulence over Springfield, MO; Evansville, IN; St. Louis, MO; and throughout Southern Illinois, both prior to and around the time of this incident. (See attached PIREPs)

## COMMUNICATIONS

National Transportation Safety Board

## FACTUAL REPORT

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## Narrative (Continued)

TWA 374 was in contact with the MKC ARTCC, Sector 54 radar position controller when the turbulence was encountered. The TWA flight crew checked in with the controller at 0849:37 as being level at FL230. At 0852:41, TWA 374 reported "...its real bumpy here can we have lower please." At 0853:03, the controller cleared the flight to descend and maintain FL130 and to expedite the descent through FL210. TWA 374 acknowledged the clearance.

At 0853:36, TWA 374 reported "Kansas City we just encountered uh severe turbulence and uh we're descending now through flight level two two zero for one three thousand." At 0854:25, the controller advised TWA 602, which was about two minutes behind TWA 374, of the severe turbulence. At 0855:20, after several inquiries regarding the turbulence from other aircraft in the area, the controller made a broadcast over his frequency "all might want to put your seat belts on."

At 0856:32, TWA 374 radioed "...be advised we were ninety miles south of St. Louis on the one five five radial when we hit that severe turbulence which was uh intense enough to uh make it difficult to read the instruments and also it it threw a lot of stuff around inside the cockpit I wouldn't recommend that you send anybody through there above flight level one eight zero." The controller asked TWA 374 if they wanted any emergency equipment waiting for them in St. Louis. At 0857:01, TWA 374 replied "that's negative I just want you to know that it's uh clear air there but it's very uh very rough it may dissipate momentarily but it's very rough right now."

At 0857:12, TWA 602 transmitted "...we're just uh fifteen miles to the north of Cape Girardeau we just got a real good jolt there at two one zero we'd like lower." At 0859:23, TWA 374 declared an emergency and requested that equipment be standing by in St. Louis because they had injured passengers and flight attendants. TWA 374 was then cleared to contact St. Louis approach control.

At 0901:57, TWA 602 transmitted "you might want to pass this information back to the uh flights behind us you know it was smooth for us at twenty one and we hit a jolt that was out of the unexpected that was hard enough that it put the flight attendants head through the uh uh upper bulkhead and uh like I said it was just one jolt and its been smooth everywhere else." At 0903:39, TWA 602 transmitted that they were going to need the paramedics in St. Louis.

## FLIGHT RECORDERS

The Cockpit Voice Recorder was not retained for readout.

The Flight Data Recorder was retained for readout. An unsuccessful attempt to readout the data was made at TWA's facility on January 31, 1997. The recorder was then taken to the NTSB Recorder Laboratory where a readout was performed on February 11, 1997. The data indicates that the changes in vertical acceleration during the most severe turbulence encounter by TWA 374 ranged from +2.5g's to -.79g's. (See attached FDR data)

## ADDITIONAL INFORMATION

The Flight Data Recorder was hand carried back to TWA on February 11, 1997.

Parties to the investigation were the Federal Aviation Administration, Trans World Airlines, and the Air Line Pilots Association.

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		Occurrence Type: Accident			
<b>Landing Facility/Approach Information</b>					
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:					
<b>Aircraft Information</b>					
Aircraft Manufacturer McDonnell Douglas		Model/Series DC-9-51		Serial Number 47746	
Airworthiness Certificate(s): Transport					
Landing Gear Type: Retractable - Tricycle					
Homebuilt Aircraft? No	Number of Seats: 114	Certified Max Gross Wt.	121000 LBS	Number of Engines: 2	
Engine Type: Turbo Fan	Engine Manufacturer: P&W	Model/Series: JT8D-17	Rated Power: 16000 LBS		
- Aircraft Inspection Information					
Type of Last Inspection Continuous Airworthiness	Date of Last Inspection 01/1996	Time Since Last Inspection 2676 Hours	Airframe Total Time 43798 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed? Yes	ELT Operated? No	ELT Aided in Locating Accident Site?			
<b>Owner/Operator Information</b>					
Registered Aircraft Owner MCDONNELL DOUGLAS FINANCE CORP		Street Address 340 GOLDEN SHORE			
		City LONG BEACH	State CA	Zip Code 90802	
Operator of Aircraft TRANS WORLD AIRLINES		Street Address 11495 NATURAL BRIDGE RD			
		City BRIDGETON	State MO	Zip Code 63044	
Operator Does Business As: TWA			Operator Designator Code: TWAA		
- 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: 01/28/1997
	Occurrence Type: Accident

**First Pilot Information**

Name On File	City On File	State On File	Date of Birth On File	Age 56
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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

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--no waivers/lim.	Date of Last Medical Exam: 08/1996
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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	11233	3209				100	1000			
Pilot In Command(PIC)	4181	1624				40	360			
Instructor										
Last 90 Days	110	110				1	11			
Last 30 Days	46	46				1	4			
Last 24 Hours	4	4								

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 NEW ORLEANS	State LA	Airport Identifier MSY	Departure Time 0742	Time Zone CST
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Destination ST. LOUIS	State MO	Airport Identifier STL	
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Type of Clearance: IFR

Type of Airspace: Class A

**Weather Information**

Source of Briefing:  
Company

Method of Briefing:

 <p><b>National Transportation Safety Board</b> <b>FACTUAL REPORT</b> <b>AVIATION</b></p>	NTSB ID: CHI97LA060	
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<b>Weather Information</b>					
WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
CGI	0750	CST	342 Ft. MSL	0 NM	0 Deg. Mag.
Sky/Lowest Cloud Condition: Scattered			12000 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: Broken		25000 Ft. AGL		Visibility: 15 SM	Altimeter: 30.00 "Hg
Temperature: -12 °C	Dew Point: -16 °C	Wind Direction: 330			Density Altitude: Ft.
Wind Speed: 11	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: 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		1	1	1	3
Other Crew					
Passengers				107	107
- TOTAL ABOARD -		1	1	110	112
Other Ground	0	0	0		0
- GRAND TOTAL -	0	1	1	110	112

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**FACTUAL REPORT**

**AVIATION**



NTSB ID: CHI97LA060

Occurrence Date: 01/28/1997

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

PAMELA S. SULLIVAN

Additional Persons Participating in This Accident/Incident Investigation:

ROBERT SKILES  
FAA, 10801 PEAR TREE LANE  
ST. ANN, MO 63074

ROBERT A YOUNG  
TWA, 11495 NATURAL BRIDGE RD  
BRIDGETON, MO 63044

RAYMOND T STETTNER  
ALPA  
O'FALLON, MO 63366