National Transportation Safety Board
Washington, DC 20594

Brief of Incident

Adopted 05/08/2001

IAD00IA032

File No. 684 | 03/30/2000 | NEW YORK CITY, NY | Aircraft Reg No. N182DN | Time (Local): 20:25 EST

Make/Model:	Boeing / 767-332
Engine Make/Model:	P&w / PW 4060
Aircraft Damage:	None
Number of Engines:	2
Operating Certificate(s):	Flag Carrier/Domestic
Name of Carrier:	DELTA AIRLINES
Type of Flight Operation:	Scheduled; International; Passenger Only
Reg. Flight Conducted Under:	Part 121: Air Carrier

	Fatal	Serious	Minor/None
Crew	0	0	13
Pass	0	0	212

Last Depart. Point:	NEW YORK, NY
Destination:	FRANKFURT, GE
Airport Proximity:	Off Airport/Airstrip

Condition of Light:	Night/Dark
Weather Info Src:	Weather Observation Facility
Basic Weather:	Visual Conditions
Lowest Ceiling:	8000 Ft. AGL, Broken
Visibility:	10.00 SM
Wind Dir/Speed:	350 / 015 Kts
Temperature (°C):	9
Precip/Obscuration:	

Pilot-in-Command Age: 54

Certificate(s)/Rating(s)
Airline Transport; Multi-engine Land

Instrument Ratings
Airplane

Flight Time (Hours)

Total All Aircraft:	19500
Last 90 Days:	Unk/Nr
Total Make/Model:	637
Total Instrument Time:	UnK/Nr

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HISTORY OF FLIGHT

On March 30, 2000, about 2025 Eastern Standard Time, a Boeing 767-332, N182DN, operated by Delta Airlines as flight 106, was not damaged when it rolled to the right while climbing through 6,500 feet, 15 miles southeast of John F. Kennedy International (JFK) Airport, New York, New York. There were no injuries to the 13 crew members and 212 passengers. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the passenger flight conducted under 14 CFR Part 121. The flight departed JFK destined for Frankfurt, Germany.

The incident occurred during the hours of night over water at about 40 degrees north latitude, and 73 degrees west longitude.

In the cockpit were the certificated airline transport pilot rated captain, first officer (FO), and the international relief pilot (IRP). The FO was the flying pilot

and was hand flying the airplane. The auto-pilot was not engaged. Air traffic control (ATC) had cleared flight 106 to fly a heading of 155 degrees after departure, and was then assigned to fly direct to BETTE intersection. BETTE intersection was located 35 nautical miles east-southeast of JFK

The three crew members were interviewed on April 6, 2000, in Atlanta, Georgia, by a Safety Board investigator.

According to the captain, ATC instructed the crew to proceed direct to BETTE intersection. The captain entered BETTE into the Flight Management System (FMS), hit the "execute" button, and engaged the lateral navigation (L-NAV) mode on the flight director, which showed a left turn about 20-25 degrees. He then turned his attention to organizing his departure and en route charts.

Shortly after, the FO said something and the captain looked up and saw the FO "wrestling" with the airplane. The captain looked at the attitude director indicator (ADI) and it was "lying on its side" right wing down. The FO had the control wheel in the full left aileron position, attempting to level the airplane.

The captain stated there was a thin deck of clouds about 6,500 feet, and it was a dark night with no moon. He also reported that they were no traffic collision avoidance system (TCAS) alerts or engine indication and crew alerting system (EICAS) warnings.

According to the FO, after BETTE intersection was entered into the FMS, he made a control input to follow the flight director, which indicated a left turn. He looked outside the airplane to scan for traffic as the turn was made. He then checked the instruments and the ADI indicated a 60 degree bank turn to the right. He responded with full left aileron followed by left rudder, which returned the airplane to level flight. He stated that from the time BETTE intersection was entered into the FMS, to the time he noted the right bank on the ADI, 5-6 seconds had elapsed.

The FO looked outside the captain's left forward window to scan for traffic. He stated there was no horizon, stars, or moon, and all he saw was darkness. He did not recall seeing any clouds.

According to the IRP, he was sitting in the jump seat between the two pilots reviewing the flight plan, when he felt the airplane yaw then roll to the right. He looked up and saw the ADI pointer at 60 degrees right wing down. At that time, he saw ground lights and a scattered cloud layer below out of the right window. He noted there was no discernable horizon. He saw the FO trying to level the airplane and suggested the use of left rudder to level the airplane.

The airplane was returned to level flight. The crew declared an emergency, dumped 20,000 pounds of fuel, and returned to JFK without incident.

PILOT INFORMATION

The captain had been employed with Delta Airlines since February 2, 1973, and was type-rated in both the B-767 and B-757 airplane. He reported a total time of 19,500 hours; 700 hours in make and model, of which 220 hours were in the last 90 days. He completed his last proficiency check in the B-767/757 in January, 2000. Prior to his transition into the B-767/757, the captain flew the Convair 880, B-727, DC-9, DC-8, L-1011, and B-737.

Five years prior to his employment with Delta, the captain flew P-3 airplanes for the Navy.

The FO had been employed with Delta Airlines since April 20, 1989, and was type-rated in both the B-767 and B-757 airplane. He reported a total of 9,000 total flight hours; 404 hours in make and model, of which 103 hours were in the last 90 days. He completed his initial B-767/757 operational experience in July, 1999. Prior to his transition into the B-767/757, the FO flew the B-737 from 1990 to 1999, and the B-727 in 1989.

Prior to his employment with Delta, the first officer served as a officer in the United States Air Force (USAF), where he was trained in both the T-38 and F-15 aircraft.

The FO reported that he had undergone unusual attitude training in the B-767/757 during his initial qualification at Delta Airlines, and had received extensive exposure to unusual attitudes during his tenure with the USAF.

METEOROLOGICAL CONDITIONS

The weather reported at JFK, at 2051, was wind from 350 degrees at 15 knots gusting to 22 knots, visibility 10 miles, ceiling 8,000 feet broken, temperature 9 degrees Celsius, dew point -3 degrees Celsius, and altimeter setting 29.97 inches of Hg.

RADAR DATA

Examination of radar data revealed there were no large transport category aircraft that had crossed along flight 106's route which could have resulted in a wake turbulence upset.

FLIGHT RECORDERS

A Fairchild model A-100 cockpit voice recorder (CVR) was brought to the Safety Board audio laboratory on April 3, 2000. The 30-minute recording was found to have no data relating to the event's period of time; therefore, no transcript was prepared.

Raw data information from the Digital Flight Data Recorder (DFDR) was extracted by Delta Airlines at its playback facility in Atlanta, Georgia, and provided to the Safety Board. According to the Safety Board's DFDR Group Chairman's report:

From 20:24:59 to 20:25:28 , the airplane's heading was maintained between 98 degrees and 100 degrees as the altitude increased from 5,100 feet to 6,300 feet.

At 20:25:29, the control wheel began a turn to the right. The right aileron was deflected and the airplane began a roll to the right. The control wheel input continued to increase to the right for the next 3.5 seconds until it reached a peak value of 63.7 degrees right wing down, at which time the bank angle reached 39.4 degrees right wing down. The other flight controls remained steady during this period.

At 20:25:33, the control wheel switched between right inputs and left inputs. The control wheel was manipulated from 63.7 degrees to the right at 20:25:32.5, to 20 degrees left at 20:25:33, then 34 degrees left at 20:25:33.5. At the same time, the elevator was moved to a 2 degree nose down position. The roll angle reached 48 degrees right at 20:25:33.5.

At 20:25:34, the control wheel was switched from a left to right position, and over the next 3-seconds the control wheel was moved between 18.8 degrees right to 40.7 degrees left, trending toward the left by the end of the period. During this 3-second period, the airplane's roll value increased from 62.9 degrees to 65.5 degrees right wing down.

The first indication of a left rudder application was recorded at 20:25:37.3. Over the next 6-seconds, rudder values changed from a steady value of 1.6 degrees

right to 4.9 degrees left as the roll angles decreased from 65.5 degrees right wing down to approximately wings level. Also during this period, the control wheel values varied between 3.4 degrees and 34.1 degrees left wing down. With the application of nose up control inputs, the pitch attitude values increased from 5 degrees nose down to 0.9 degrees nose up and the decrease in altitude values stopped.

The DFDR parameters did not display any unusual or anomalous characteristics during the remainder of the flight.

SYSTEMS

A comprehensive review of the airplane's systems was accomplished by a Safety Board's Systems Group Chairman. According to the Group Chairman's factual report, a post flight inspection of the airplane was completed by Delta Airlines engineering and maintenance personnel. Functional checks and inspections of the auto flight system, lateral control system, cable tensions, mode control panel, and hydraulic system and filters revealed no anomalies. The three flight control computers (FCC) were removed but not tested. The maintenance control display panel (MCDP) was removed and interrogated to determine if any auto pilot faults were recorded on the incident flight. No faults were recorded on the incident flight.

Possible failure modes were examined with the manufacturer to determine if a scenario could be developed that matched the incident DFDR data and crew statements. The examination revealed there were no system failure mode scenarios that correlated to the DFDR data and crew statements.

MAINTENANCE

The airplane was on a continuous inspection program. The last inspection was performed on March 29, 2000, at a total airframe time of 5,514 hours. According to the crew, there were no maintenance carry over items from the previous flight.

ADDITIONAL INFORMATION

At the time of the event, Delta's B-767 flight operations manual (FOM) addressed unusual attitude recovery procedures in the avoidance and escape section of the manual. According to the unusual attitude recovery procedures, if an upset occurred, the pilot was instructed to roll the wings level. It did not address the use of rudder to assist in the recovery.

During the year prior to this event, Delta had developed a formalized unusual attitude training procedure for their B-767 training manual called Critical Aircraft Situational Training (CAST) maneuvers. This new category of training was implemented on April 1, 2000, and included a 14-minute CAST video, and for the crews to practice simulated upset recoveries in the simulators. The training manual stated that the use of aileron and coordinated rudder should be used during upset recoveries.

A Federal Aviation Administration Advisory Circular (AC) 60-4A, "Pilot's Spatial Disorientation," conducted tests with qualified instrument pilots. The results indicated that it can take as long as 35 seconds to establish full control by instruments after a loss of visual reference of the earth's surface. AC 60-4A further stated that surface references and the natural horizon may become obscured even though visibility may be above visual flight rules minimums and that an inability to perceive the natural horizon or surface references is common during flights over water, at night, in sparsely populated areas, and in low-visibility conditions.

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

The first officer's failure to maintain control of the airplane during climb out over water at night, which was a result of spatial disorientation. Factors in the

incident were the cloud layer and dark night.