



# National Transportation Safety Board Aviation Accident Data Summary

<b>Location:</b>	Newark, NJ	<b>Accident Number:</b>	NYC05FA054
<b>Date &amp; Time:</b>	03/02/2005, 1550 EST	<b>Registration:</b>	N78008
<b>Aircraft:</b>	Boeing 777-200	<b>Injuries:</b>	214 None
<b>Flight Conducted Under:</b>	Part 121: Air Carrier - Scheduled		

## Analysis

During a near maximum gross weight takeoff from runway 4L, in gusty winds, the captain recalled that the airplane's rotation was normal, but it did not "fly away" as he expected. As the captain continued to rotate the airplane, the tail section struck the ground, and the "tail strike" EICAS (Engine Indication and Crew Alerting System) message illuminated. The flight crew then completed the takeoff sequence, completed all checklists, jettisoned fuel, and returned to the airport where an uneventful landing was made. The winds recorded at the airport, about 1 minute after the accident, were from 280 degrees, at 21 knots, gusting to 28 knots. Review of the DFDR data revealed that at the time the takeoff roll began, the captain's control wheel was turned 25.5 degrees to the left, resulting in the upward deflection of the left wing outboard aileron, flaperon, and 6 of 7 spoilers, which was consistent with a correction for crosswind conditions. As the takeoff roll continued, the control wheel input varied between 19.6 degrees and 37.5 degrees to the left, and at the approximate point of rotation, the control wheel was turned to the left 38.4 degrees. The control column position also began to move aft at the point of rotation, with a force of 22.7 pounds, and the pitch of the airplane rose to 3 degrees nose up. As the pilot continued the rotation, he held the pitch control at a value consistent with previous recorded flights, before pulling the control column further aft, increasing the pitch angle to the tail strike attitude of approximately 13 degrees nose up. One second later, as both left and right main gear indicated no weight on wheels, the control column position reached its maximum value during the event, 9.2 degrees aft, and the pitch reached 17.8 degrees nose up. A Safety Board vehicle performance study compared the airspeed and groundspeed recorded during the accident, and determined that a wind gust caused an approximate 7 knot loss in airspeed, the lateral control wheel input during the rotation ranged from 24 to 37 degrees, and the maximum pitch rate during the rotation was approximately 6.0 degrees/second. Using these data in a Boeing estimation method, it was determined that three factors contributed to the reduced tail clearance during the takeoff. These factors were the loss of airspeed that resulted from a tailwind gust during the rotation, the loss of lift that resulted from the deflection of the lateral control surfaces, and a pitch rate in excess of that recommended. These factors combined for a total reduction in tail clearance of approximately 150-170 percent. It was concluded in the performance study that reducing the pitch rate to the Boeing recommended 2.5 degrees/second would have brought the tail clearance reduction to the 80 percent to 100 percent of nominal level, and from that point, a 1-knot increase in rotation speed would have provided about a 7 percent increase to the tail clearance margin. According to Boeing, the typical liftoff attitude was 8.5 degrees, the minimum tail clearance was 37 inches, and the tail strike pitch attitude was 12.1 degrees up. The operator's flight manual warned pilots to "Avoid any tendency to rapidly rotate to a 10 degree pitch attitude and hold it until lift-off. This technique invites a tail strike." In addition, neither Boeing, nor the operator, had procedures or policies for adding an increase in rotation speed to compensate for crosswind or tailwind conditions.

## Probable Cause

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The captain's failure to follow company procedures, which resulted in a tail strike. Contributing were the gusty crosswind and tailwind conditions, and the manufacturer's failure to provide adequate performance planning data to account for gusty crosswinds during takeoff.

## Findings

Occurrence #1: DRAGGED WING, ROTOR, POD, FLOAT OR TAIL/SKID

Phase of Operation: TAKEOFF

### Findings

1. (F) WEATHER CONDITION - CROSSWIND
2. ROTATION - EXCESSIVE - PILOT IN COMMAND
3. (F) WEATHER CONDITION - TAILWIND
4. (C) PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT IN COMMAND
5. (F) PERFORMANCE DATA - INADEQUATE - MANUFACTURER

## Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Instructor; Commercial	<b>Age:</b>	59
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Instrument Rating(s):</b>	Airplane
<b>Other Aircraft Rating(s):</b>	None	<b>Instructor Rating(s):</b>	None
<b>Flight Time:</b>	17000 hours (Total, all aircraft), 4100 hours (Total, this make and model), 12000 hours (Pilot In Command, all aircraft), 217 hours (Last 90 days, all aircraft), 80 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Co-Pilot Information

<b>Certificate:</b>	Airline Transport; Flight Instructor; Commercial; Flight Engineer	<b>Age:</b>	45
<b>Airplane Rating(s):</b>	Multi-engine Land; Multi-engine Sea; Single-engine Land; Single-engine Sea	<b>Instrument Rating(s):</b>	Airplane
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Instructor Rating(s):</b>	Airplane Single-engine; Instrument Airplane
<b>Flight Time:</b>	15000 hours (Total, all aircraft), 3438 hours (Total, this make and model), 8000 hours (Pilot In Command, all aircraft), 269 hours (Last 90 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Manufacturer:</b>	Boeing	<b>Registration:</b>	N78008
<b>Model/Series:</b>	777-200	<b>Engines:</b>	2 Turbo Fan
<b>Operator:</b>	CONTINENTAL AIRLINES INC	<b>Engine Manufacturer:</b>	General Electric
<b>Air Carrier Operating Certificate:</b>	Flag carrier (121)	<b>Engine Model/Series:</b>	90-90B
<b>Flight Conducted Under:</b>	Part 121: Air Carrier - Scheduled		

## Meteorological Information and Flight Plan

Observation Facility, Elevation:	EWR, 18 ft msl	Weather Information Source:	Weather Observation Facility
Conditions at Accident Site:	Visual Conditions	Lowest Ceiling:	None
Condition of Light:	Day	Wind Speed/Gusts, Direction:	23 knots/ 28 knots, 320°
Temperature:	0° C / -13° C	Visibility	10 Miles
Precipitation and Obscuration:			
Departure Point:	(EWR)	Destination:	Hong Kong (VHHH)

## Airport Information

Airport:	Newark International Airport (EWR)	Runway Surface Type:	Asphalt; Concrete
Runway Used:	040	Runway Surface Condition:	Dry
Runway Length/Width:	11000 ft / 150 ft		

## Wreckage and Impact Information

Crew Injuries:	16 None	Aircraft Damage:	Substantial
Passenger Injuries:	198 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None

## Administrative Information

Investigator In Charge (IIC):	Jill M Andrews	Adopted Date:	02/28/2008
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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