National Transportation Safety Board
Aviation Accident Final Report

Location:	Newark, NJ	**Accident Number:**	IAD05LA118A
Date & Time:	08/08/2005, 1230 EDT	**Registration:**	N73270
Aircraft:	Boeing 737-824	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	158 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

Six Embraer 145 airplanes were parked side-by-side in an unmarked, paved "run-up block" area between two parallel taxiways at a large, international airport, as they waited for further instruction from air traffic control (ATC). A Boeing 737-824 was instructed by ATC to continue on the taxiway, behind the line of airplanes, and park between the fifth and sixth airplane in the row. With the nose wheel centered on the taxi line, the right winglet of the Boeing struck the tails of the first two airplanes parked in the "run-up block," which resulted in substantial damage to one parked airplane. According to Advisory Circular 150/5300-13, Taxiway and Taxilane Design Rationale, "The need for ample wingtip clearance is driven by the fact that the pilots of most modern jets cannot see their airplane's wingtips." Taxiway Centerline to Object Separation states: "...a minimum separation between taxiway centerline and an object is 0.70 times the wingspan of the most demanding airplane plus 10 feet (3m)." According to the Airman's Information Manual, 2-3-4b. Taxiway Markings, Taxiway Centerline: "The taxiway centerline...provides a visual cue to permit taxiing along a designated path. Ideally the aircraft should be kept centered over this line during taxi to ensure wing-tip clearance." According to the FAA inspector who responded to the scene, the nose wheel of the Boeing was centered over the taxiway centerline.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The airport's failure to install markings on a parking "block" that bordered the taxiway, which failed to provide adequate clearance between taxiing airplanes and airplanes parked in the block. Factors in the accident were air traffic control's use of the unmarked parking "block," and the flight crew's misjudgement of the clearance between their airplane and the parked airplanes in the block, during taxi.

Findings

Occurrence #1: COLLISION BETWEEN AIRCRAFT (OTHER THAN MIDAIR)
Phase of Operation: TAXI - TO TAKEOFF

Findings
1. (C) AIRPORT FACILITIES,TAXIWAY MARKING - NOT INSTALLED
2. (F) CLEARANCE - MISJUDGED - FLIGHTCREW
3. (F) PROCEDURE INADEQUATE - ATC PERSONNEL(LCL/GND/CLNC)

Factual Information

On August 8, 2005, at 1230 eastern daylight time, a Boeing 737-824, N73270, operated by Continental Airlines as flight 1435, sustained minor damage when it impacted two parked Embraer 145 airplanes at Newark Liberty International Airport (EWR), Newark, New Jersey. One Embraer (N10575) sustained substantial damage, the other Embraer (N17185) sustained minor damage. The 2 certificated airline transport pilots, 6 cabin attendants, and 150 passengers on the Boeing were not injured. The 6 crewmembers and 84 passengers on the parked airplanes were not injured. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed for the flight destined for Phoenix Sky Harbor International Airport (PHX), Phoenix, Arizona, and conducted under 14 CFR Part 121.

The accident occurred at the west end of taxiway yankee, in an unmarked paved area, or "run up block," used by air traffic control to hold airplanes as they awaited their departure clearances. The paved area was between the yankee and whiskey taxiways, which were oriented east/west and parallel to each other. Taxiway whiskey was north of yankee and the paved area.

Six Embraer airplanes were parked in a line, east to west, in the run up block facing north as the Boeing approached. The Embraer 145 parked at the easternmost end of the block, N17185, was operated as Continental Express flight 2896. The Embraer 145 parked to its immediate left, N10575, was operated as Continental Express flight 3071.

The captain of the Boeing provided a written statement, that said there were delays at the gate prior to pushback from the gate and taxi. After a series of turns, the airplane taxied westbound on taxiway yankee. The crew was instructed by air traffic control (ATC) to "find a parking spot between" the parked Embraers.

The Boeing continued along yankee with the nose wheel on the taxi line. According to the captain, the airplane "shuddered" as if he "taxied over a drainage grate." An announcement was heard over the radio on the ground control frequency that the Boeing had struck two Embraers, and the crew stopped the airplane.

According to the Boeing captain, the "shudder" occurred when the second airplane was struck. Until he was alerted on the radio, he was not aware that his airplane had contacted anything.

The first officer provided a statement that was consistent with the captain's. Both pilots stated that they were attentive, that the Embraers appeared to be parked in a uniform line, and that they perceived adequate clearance from the parked airplanes.

In a written statement, the captain of flight 2896 explained that ground control parked them on the east end of the run up block, and advised that they would be the last airplane parked in the block.

After about 20 minutes, the captain of flight 2896 heard ATC direct the Boeing behind the line of parked Embraers to a recently vacated "space" in the unmarked block. Shortly thereafter, his airplane "shook", and he watched out the window as the right winglet of the Boeing then damaged the rudder of flight 3071.

The captain of flight 2896 alerted ATC, and the Boeing stopped on the taxiway.

Examination of all three airplanes revealed that the right winglet on the Boeing, and the rudder on flight 2896 sustained minor damage. The rudder of flight 3071 was separated from its upper mount.

The captain of the Boeing held an airline transport pilot certificate with ratings for airplane single engine land and multiengine land. He was issued a Federal Aviation Administration (FAA) first class medical certificate on April 1, 2005.

The captain reported 10,000 hours of total flight experience, 6,200 hours of which were in make and model. He reported 80 total hours of experience in the 30 days prior to the accident, and 3 hours of experience in the 24 hours prior.

The first officer of the Boeing held an airline transport pilot certificate with ratings for airplane single engine land and multiengine land. He was issued a Federal Aviation Administration (FAA) second class medical certificate on April 8, 2005.

The first officer reported 8,054 hours of total flight experience, 3,151 hours of which were in make and model. He reported 27 total hours of experience in the 30 days prior to the accident, and 2 hours of experience in the 24 hours prior.

Both the captain and the first officer reported that there were no mechanical deficiencies with the airplane.

A Safety Board airport facilities specialist examined the accident site on August 11, 2005. The northern edge of taxiway yankee and the southern edge of taxiway whiskey were unmarked, and the dimensions of the block area were unmarked and undefined. At the time of the accident, the operation of the concrete block at the end of Runway 11 was not included in the April 7, 2004 Letter of Agreement (LOA) between the Port Authority of New York and New Jersey (PANYNJ) EWR and EWR ATC.

According to PANYNJ EWR personnel, the concrete block at the Runway 11 end was not intended for use as an aircraft holding bay. The concrete area, which was installed approximately 5 years prior to the accident, was intended to be a "run-up block" for Runway 4L. Shortly after installing the concrete run-up block, PANYNJ EWR personnel noticed EWR ATC was using the area as an aircraft holding bay. Although the PANYNJ EWR personnel asked EWR ATC to discontinue holding aircraft in the Runway 11 run-up block, PANYNJ EWR personnel noticed that EWR ATC continued to use the area for holding aircraft.

According to EWR ATC personnel, the concrete block at the Runway 11 end was being used as a staging area for regional jets and Boeing 737 aircraft, primarily during inclement weather to prohibit gridlock from occurring. EWR ATC personnel were not aware of the intended use of the concrete block, and nothing was detailed in EWR ATC's Standard Operating Procedures about the Runway 11 concrete block area or any other block on the airfield. Additionally, EWR ATC personnel had taxied aircraft behind the staging area in the past and were not aware of any mention from PANYNJ EWR personnel not to use the block as a staging area.

According to Advisory Circular 150/5300-13, Taxiway and Taxilane Design Rationale: "The need for ample wingtip clearance is driven by the fact that the pilots of most modern jets cannot see their airplane's wingtips." Taxiway Centerline to Object Separation states: "...a minimum separation between taxiway centerline and an object is 0.70 times the wingspan of the most demanding airplane plus 10 feet (3m)."

According to the Airman's Information Manual, 2-3-4b. Taxiway Markings, Taxiway

Centerline: "The taxiway centerline...provides a visual cue to permit taxiing along a designated path. Ideally the aircraft should be kept centered over this line during taxi to ensure wing-tip clearance."

According to the FAA inspector who responded to the scene, the nose wheel of the Boeing was centered over the taxiway centerline.

Following the accident, the FAA Eastern Region Airport Division issued a letter to PANYNJ stating that prior to resuming use of the block of Runway 11, PANYNJ needed to provide a statement of how the block was to be used, including a revised LOA between EWR ATC and PANYNJ EWR.

At 1243, the weather reported at the airport included a 13,000-foot ceiling with 5 miles of visibility in haze. The wind was from 230 degrees at 6 knots.

This report was modified on March 27, 2007.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Flight Engineer	**Age:**	55, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without Waivers/Limitations	**Last FAA Medical Exam:**	04/01/2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	10/01/2004
Flight Time:	10000 hours (Total, all aircraft), 6200 hours (Total, this make and model), 6000 hours (Pilot In Command, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	54, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 With Waivers/Limitations	**Last FAA Medical Exam:**	03/01/2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	8054 hours (Total, all aircraft), 3151 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N73270
Model/Series:	737-824	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	31632
Landing Gear Type:	Retractable - Tricycle	**Seats:**	158
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	174200 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Jet
Airframe Total Time:		**Engine Manufacturer:**	CFM International
ELT:	Installed, not activated	**Engine Model/Series:**	CFM56-7
Registered Owner:	Wells Fargo Bank Northwest NA Trustee	**Rated Power:**	
Operator:	CONTINENTAL AIRLINES INC	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	VM2R

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	EWR, 18 ft msl	**Distance from Accident Site:**	
Observation Time:	1243 EDT	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 2000 ft agl	**Visibility**	5 Miles
Lowest Ceiling:	Overcast / 13000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	27°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	NEWARK, NJ (EWR)	**Type of Flight Plan Filed:**	IFR
Destination:	Phoenix, AZ (PHX)	**Type of Clearance:**	Unknown
Departure Time:	EDT	**Type of Airspace:**	Class A

Airport Information

Airport:	Newark Liberty International (EWR)	**Runway Surface Type:**	
Airport Elevation:	18 ft	**Runway Surface Condition:**	
Runway Used:	N/A	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	8 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	150 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	158 None	**Latitude, Longitude:**	40.700000, -74.172222

Administrative Information

Investigator In Charge (IIC):	Brian C Rayner	**Report Date:**	04/02/2007
Additional Participating Persons:	Charlie Emering; FAA FSDO; Teterboro, NJ Toby Carroll; Continental Airlines; Houston, TX Fred Junek; Express Jet; Houston, TX		
Publish Date:	02/15/2018		
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 pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		