National Transportation Safety Board
Aviation Incident Final Report

Location:	Jamaica, NY	**Incident Number:**	DCA08IA019
Date & Time:	12/17/2007, 1530 EDT	**Registration:**	N272SK
Aircraft:	EMBRAER 145	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	53 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

Prior to the incident flight, the Embraer EMB-145 was parked overnight with its tail pointed into the wind. During this time period, the winds were reported to be very high (on the order of 30-40 kts). The aircraft was equipped with a mechanical gust lock system designed to immobilize the forward torque tube of the elevator control system when the system is engaged. During takeoff, the flightcrew performed an emergency high-speed aborted takeoff because the captain felt a control anomaly during rotation. An inspection of the elevator control system components revealed that both left and right elevator control rods had fractured completely, rendering the elevator system inoperable. The elevator control rods fractured when the elevator surfaces repeatedly moved off the rear elevator stops due to wind gusts.

An airworthiness directive issued by the Federal Aviation Administration (AD 2005-26-15) was already in place at the time of this incident, which mandated replacement of the mechanical gust lock system on the Embraer 145 airplane with a more effective electromechanical gust lock system and required some repetitive inspections be performed until such time as the electromechanical system was installed. However, based on the findings in this incident, the FAA determined that the interim inspections mandated by AD 2005-26-15 were not adequate to detect the discrepancies exhibited in this event. As a result, the FAA subsequently issued a new airworthiness directive (AD 2008-03-03) to improve the interim inspections required until terminating action was taken by operators and also superceded AD 2005-26-15 with AD 2008-10-08 to shorten the compliance time for installation of the electromechanical gust lock system.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: the failure of the elevator control rods due to exposure to high winds while the aircraft was parked overnight.

Contributing to this incident was the failure of the existing airworthiness directive to adequately detect this discrepancy given the known deficiency with the mechanical gust lock

design.

Findings

Occurrence #1: ON GROUND/WATER ENCOUNTER WITH WEATHER
Phase of Operation: STANDING - ENGINE(S) NOT OPERATING

Findings
1. (C) WEATHER CONDITION - GUSTS
2. (C) FLT CONTROL SYST,ELEVATOR CONTROL CABLE/ROD - FAILURE,TOTAL

Occurrence #2: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: STANDING - ENGINE(S) NOT OPERATING

Factual Information

HISTORY OF FLIGHT

On December 17, 2007, at 3:30 pm, Eastern Standard Time, the flight crew of a Chautauqua Airlines Embraer EMB-145 performed an emergency high-speed aborted takeoff at John F. Kennedy International Airport (JFK) due to a serious elevator malfunction. The malfunction completely disabled the elevator system of the aircraft, either before or while the captain was rotating the aircraft for flight. The captain stated that during the rotation maneuver he felt an anomaly that caused him to abort the takeoff and stop the aircraft. Taxi back to the gate was uneventful and all 50 passengers and three flight deplaned normally.

INJURIES TO PERSONS

No injuries were reported.

DAMAGE TO AIRPLANE

Following the incident, an internal inspection of the elevator control system components revealed that both left and right elevator control rod assemblies (P/N 145-22141-405) had fractured completely through their circumferences rendering the elevator control of the aircraft inoperable. In addition, damage to control stops and horizontal stabilizer sheet metal was observed. A metallurgical examination of the control rods indicated that both failed in compression with some bending moment observed.

OTHER DAMAGE

None.

AIRPLANE INFORMATION

A gust lock system is installed on the aircraft to lock the elevator to avoid damage to elevator components when the aircraft is subjected to strong gusts on the ground.

The EMB 145 can be equipped with either a mechanical gust lock system or an electromechanical gust lock system. The incident aircraft was equipped with a mechanical gust lock system. The mechanical gust lock is designed to immobilize the forward torque tube, which is attached to the control column, when it is engaged. Some stretching of elevator cables will occur when the elevator surface is exposed to high loads.

The electromechanical gust lock system uses a locking mechanism that acts directly on the elevator. The gust lock lever in the cockpit activates an electromechanical actuator that drives locking pins into the elevator panels. No stretching of the elevator cables can occur with the electromechanical gust lock system engaged.

On September 27, 2002, Embraer issued Service Bulletin 145-27-0087 which called for repetitive inspections of components of the elevator system due to possible damage caused by strong wind gusts on the ground.

On November 8, 2002, the Brazilian Servico Publico Federal Departamento de Aviacao Civil issued Airworthiness Directive 2002-01-01R3, with similar instructions to operators. This airworthiness directive also called for the replacement of the mechanical gust lock system with an electromechanical system within 10,000 flight hours or 60 calendar months. This AD only applied to Brazilian registered airplanes.

On February 3, 2006, the FAA issued airworthiness directive 2005-26-15, that required US operators of EMB 145 aircraft to also perform similar repetitive inspections and also install electromechanical gust lock systems within 10,000 flight hours or 60 months.

In response to the Chautauqua Airlines JFK incident, Embraer issued Alert Service Bulletin 145-27-A106R0 on December 23, 2007. This service bulletin advised operators to perform a detailed inspection of the elevator control system (including a check to insure that the elevators responded properly to control column inputs) within the next 20 flight hours, and it also advised the operators to repeat these inspections any time the aircraft was exposed to wind gusts over 35 knots while on the ground. This service bulletin only applied to aircraft that did not already have the electromechanical gust lock system installed.

This service bulletin was revised on December 27, 2007. The revised service bulletin advised operators to perform the detailed inspection of the elevator control system, perform a daily check prior to the first flight of the day to insure proper elevator response to control column movements, and to repeat the detailed elevator control system check every 600 flight hours or if the aircraft is exposed to wind gusts over 50 knots while on the ground. These actions would be no longer required when an electromechanical gust lock system was installed on the aircraft.

The service bulletin was revised again on December 28, 2007. This revision modified the daily elevator inspection to include a provision for performing a detailed check of the elevator skin around the hinge areas while the elevators were held in a trailing edge up position.

The FAA incorporated the service bulletin's recommended actions (with some minor revisions) in Airworthiness Directive AD 2008-03-03, effective February 14, 2008.

And last, on May 23, the FAA issued AD 2008-10-08. This AD superseded AD 2005-26-15, called for repetitive inspections, and shortened the compliance time for the electromechanical gust lock retrofit to 90 days after May 23, 2008, or 500 flight hours, whichever occurs first.

All EMB 145 aircraft now have electromechanical gust lock systems.

METEOROLOGICAL INFORMATION

Prior to the accident flight, the aircraft was parked overnight at JFK airport with its tail pointed into the wind. During the night the winds were reported to range between 30 and 40 knots.

Pilot Information

Certificate:	Airline Transport	**Age:**	28, Male
Airplane Rating(s):	Multi-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Airship	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without Waivers/Limitations	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	07/06/2007
Flight Time:	3900 hours (Total, all aircraft), 1950 hours (Total, this make and model), 1900 hours (Pilot In Command, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport	**Age:**	23, Male
Airplane Rating(s):	Multi-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):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With Waivers/Limitations	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	01/01/2007
Flight Time:	1100 hours (Total, all aircraft), 53 hours (Total, this make and model), 857 hours (Pilot In Command, all aircraft), 53 hours (Last 90 days, all aircraft), 19 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	EMBRAER	**Registration:**	N272SK
Model/Series:	145 LR	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	145306
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	48500 lbs
Time Since Last Inspection:		**Engines:**	2
Airframe Total Time:		**Engine Manufacturer:**	
ELT:	Not installed	**Engine Model/Series:**	
Registered Owner:	Wells Fargo Bank Northwest NA	**Rated Power:**	
Operator:	Chautauqua Airlines	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:	Delta Connection	**Operator Designator Code:**	CHQA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	BUF	**Observation Time:**	1551 EDT
Distance from Accident Site:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 6000 ft agl	**Temperature/Dew Point:**	
Lowest Ceiling:		**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	17 knots/ 27 knots, 310°	**Visibility (RVR):**	
Altimeter Setting:	30.01 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:			
Departure Point:	New York, NY (JKF)	**Type of Flight Plan Filed:**	IFR
Destination:	Buffalo, NY (BUF)	**Type of Clearance:**	IFR
Departure Time:	1530 EDT	**Type of Airspace:**	

Airport Information

Airport:	John F. Kennedy International (JFK)	**Runway Surface Type:**	Asphalt; Concrete
Airport Elevation:	13 ft	**Runway Surface Condition:**	Dry
Runway Used:	31L	**IFR Approach:**	None
Runway Length/Width:	14572 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Minor
Passenger Injuries:	50 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	53 None	**Latitude, Longitude:**	40.639722, 73.778889 (est)

Administrative Information

Investigator In Charge (IIC):	Robert P Benzon	**Adopted Date:**	06/27/2011
Additional Participating Persons:	TR Proven; Federal Aviation Administration, AAI-100; Washington, DC		
Publish Date:	06/27/2011		
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/.		

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