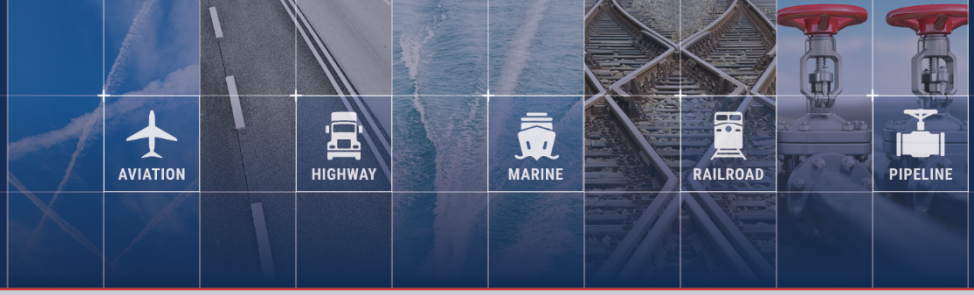

Aviation Investigation Final Report

Location:	Pacific Ocean,	**Accident Number:**	WPR11LA203
Date & Time:	April 11, 2011, 07:00 UTC	**Registration:**	N766AN
Aircraft:	Boeing 777-223	**Aircraft Damage:**	None
Defining Event:	Turbulence encounter	**Injuries:**	2 Serious, 2 Minor, 227 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

As the airplane was climbing, the flight crew observed a small weather buildup in front of them. They requested a deviation around the weather, but the air traffic controller requested that they stand by. After entering the weather, they received clearance to turn; however, about 24,000 feet, the airplane encountered about 11 seconds of moderate, and then severe, turbulence. During the encounter, two flight attendants received broken ankles while conducting work in the aft cabin area. The digital flight data recorder revealed that during the encounter vertical acceleration forces went from 2.2G to 0.6913G within 1 second, to a minimum of 0.496G about 5 seconds after the 2.2G maximum.

A weather study conducted by a National Transportation Safety Board meteorologist revealed a frontal wave over the Japanese coast with a warm front extending eastward in the vicinity of the turbulence encounter. A gale force wind was expected. The region of the turbulence encounter also contained low to mid-level clouds with cloud tops near 14,000 feet; cumulonimbus cloud development, with tops up to 26,000 feet, was slightly upstream from the turbulence encounter. Review of the weather package given to the flight crew found no forecasts for turbulence and no Significant Meteorological Information advisories (SIGMETS) were in effect for the route of flight. At the time of the occurrence, there were no reports of turbulence from pilots ahead of the accident flight and the flight crew saw no indication of turbulence on their weather radar.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An inadvertent encounter with convective-induced turbulence upon entering cumulonimbus clouds.

Findings

Environmental issues	Convective turbulence - Effect on personnel

Factual Information

History of Flight

Enroute-climb to cruise	Turbulence encounter (Defining event)

On April 11, 2011, at 6:58:38 coordinated universal time (UTC), American Airlines Flight 170, a Boeing 777-223, N766AN, experienced severe turbulence during climb over international waters about 194 nautical miles east of Narita, Japan. Four flight attendants were injured; two flight attendants sustained minor injuries, while two flight attendants sustained serious injuries. There were no injuries to the other 227 passengers and crew, and the airplane was not damaged. The scheduled international passenger flight originated from Narita International Airport, Narita Japan and was en route to Los Angeles International Airport, Los Angeles, California under the provisions of Title 14 Code of Federal Regulations Part 121.

The flight crew reported that as the airplane was climbing, they observed a small weather build up in front of them. They requested a deviation around the weather, but ATC informed them to standby. The first officer reported that when the flight crew received the clearance to turn the airplane was already in the weather. At about 24,000 feet, the airplane encountered moderate then severe turbulence for about 11 seconds. Although the seatbelt signs were still illuminated from takeoff, the flight attendants were working in the cabin at the time of the occurrence.

During the turbulence encounter, both the number 2 and number 3 flight attendants received fractured ankles. The number 2 flight attendant was working in the aft galley when she was thrown to the floor of the airplane, landing hard on her right hand and the outside of her right ankle. The number 3 flight attendant was washing her hands in the 4R lavatory when she could not maintain balance and fell, striking her right foot.

The Digital Flight Data Recorder (DFDR) was sent to the National Transportation Safety Board (NTSB) recorders division for data analysis. According to the DFDR data, the event occurred at 6:58:38; at this time, the airplane was at a pressure altitude of about 24,000 feet, with a speed of 336 KIAS. During the event, the vertical acceleration went from 2.2G's to 0.6913G's within 1 second, to a minimum G of 0.496 about 5 seconds after the 2.2G maximum.

A weather study conducted by a NTSB meteorologist revealed a frontal wave over the Japanese coast with a warm front extending eastward in the vicinity of the turbulence encountered; developing gale force winds were expected. An upper level chart for 18,000 feet depicted west-southwesterly winds of 40-45 knots in the region. The region also contained low to mid-level clouds with cloud tops near 14,000 feet; cumulonimbus cloud development, with tops up to 26,000 feet, was slightly upstream from the turbulence encounter. At 0732, an airplane along a similar route reported wind at 24,000 feet from 245 degrees at 65 knots.

Review of the weather package given to the flight crew by American Airlines dispatch found no forecasts for turbulence. No SIGMETS were in effect for the route of flight. At the time of the occurrence, there were no reports of turbulence from airplanes ahead of the accident flight, and the flight crew saw no indications on their weather radar of any returns.

Pilot Information

Certificate:	Airline transport; Flight engineer	**Age:**	61,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	April 1, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 26, 2010
Flight Time:	174 hours (Last 90 days, all aircraft), 82 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight engineer	**Age:**	54,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	December 15, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 15, 2011
Flight Time:	47 hours (Last 90 days, all aircraft), 47 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight engineer	**Age:**	56,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	October 19, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N766AN
Model/Series:	777-223	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	32880
Landing Gear Type:	Retractable - Tricycle	**Seats:**	263
Date/Type of Last Inspection:	Continuous airworthiness	**Certified Max Gross Wt.:**	648000 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	33558 Hrs at time of accident	**Engine Manufacturer:**	Rolls Royce
ELT:	Installed, not activated	**Engine Model/Series:**	Trent 892
Registered Owner:	AMERICAN AIRLINES INC	**Rated Power:**	
Operator:	AMERICAN AIRLINES INC	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	AALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	NRT,141 ft msl	**Distance from Accident Site:**	194 Nautical Miles
Observation Time:	06:30 Local	**Direction from Accident Site:**	267°
Lowest Cloud Condition:	Few / 3000 ft AGL	**Visibility**	25 miles
Lowest Ceiling:	Broken	**Visibility (RVR):**	
Wind Speed/Gusts:	65 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	245°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	-38°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Narita (NRT)	**Type of Flight Plan Filed:**	IFR
Destination:	Los Angeles, CA (LAX)	**Type of Clearance:**	IFR
Departure Time:	06:25 UTC	**Type of Airspace:**	

Airport Information

Airport:	Narita International Airport NRT	**Runway Surface Type:**	
Airport Elevation:	141 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Serious, 2 Minor, 11 None	**Aircraft Damage:**	None
Passenger Injuries:	216 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 2 Minor, 227 None	**Latitude, Longitude:**	35.893333,143.871673(est)

Administrative Information

Investigator In Charge (IIC):	Rich, Jefferey
Additional Participating Persons:	
Original Publish Date:	November 29, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=78892