National Transportation Safety Board
Aviation Accident Final Report

Location:	Pacific Ocean, PO	**Accident Number:**	LAX02LA146
Date & Time:	05/01/2002, 0629 UTC	**Registration:**	N182UA
Aircraft:	Boeing 747-422	**Aircraft Damage:**	None
Defining Event:		**Injuries:**	1 Serious, 6 Minor, 283 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

The flight encountered severe turbulence while operating at 31,000 feet msl, and a flight attendant sustained a serious injury. The encounter occurred near position 174 degrees 20 minutes east longitude and 24 degrees 18 minutes south latitude. According to the captain, prior to the turbulence event, the airplane was flying over a flat broken cloud layer with a smooth ride. He reported, in part: "Passing 25 degrees south at FL310 we noticed that the cloud tops were gradually rising. Radar showed very little - a few green returns off to the right. We were in an area of no forecasted turbulence or cumulonimbus buildups. I turned on the seatbelt sign and made a passenger announcement." The seriously injured flight attendant was in the process of securing the duty free cart when she was struck by it during the turbulence encounter. Digital Flight Data Recorder (DFDR) data showed that the airplane experienced a series of oscillating vertical and lateral accelerations that lasted almost 2 minutes. The vertical accelerations (expressed in units of gravity or "g's", 1.0 is normal) ranged from a low of +0.31 to a high of +1.7. The lateral accelerations (a value of zero is normal) ranged from 0.119 left to 0.115 right. During the time frame of the encounter, the airplane's Flight Management Computer reported winds aloft went from 92 knots to 50, then back to 101. The indicated airspeed also varied from a pre-encounter average value of 315 knots to a peak of 344 before returning to the nominal 315 value. Review of the weather portion of the dispatch and flight release package provided to the flight crew noted that in the vicinity of 173 degrees east and 25 degrees south the upper air winds between 31,000 and 35,000 feet were forecast to be from 290 degrees at 102 to 113 knots. The document also noted the possibility of turbulence from longitudes 164 degrees east to 172 degrees east along the planned flight track. The National Weather Service Significant Weather Forecast Chart valid for the flight showed a 120 knot jet stream and the possibility of occasional moderate or lesser clear air turbulence south of the accident location and an area of isolated cumulo nimbus clouds with tops to 40,000 feet to the north. The only SIGMETS in effect for turbulence concerned an area some 900 miles to the west and south of the accident location.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: An in-flight encounter with clear air turbulence and wind shear, which resulted in a serious injury to a flight attendant.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: CLIMB - TO CRUISE

Findings
1. (C) WEATHER CONDITION - TURBULENCE,CLEAR AIR

Factual Information

On May 1, 2002, at 0629 coordinated universal time (UTC), a Boeing 747-422, N182UA, encountered clear air turbulence while climbing through approximately 31,000 feet and while in international airspace over the Pacific ocean about 700 miles north of New Zealand. According to the airplane's onboard Flight Management Computer (FMC) recorded data, the aircraft was at location 174.0027 degrees east longitude and 24.4684 degrees south latitude when the encounter occurred. The airline transport certificated pilot and remaining 3 flight crewmembers were not injured. Of the 17 flight attendant crewmembers, 1 was seriously injured, 1 received minor injuries, and 15 were not injured. Of the 269 passengers aboard, 5 received minor injuries and 264 were not injured. The airplane was not damaged. The flight was operated by United Airlines, Incorporated, under 14 CFR Part 121, as flight 862, a regularly scheduled international passenger flight. The flight departed from Sydney, Australia at 0353 UTC and was destined for San Francisco, California. Following the encounter with turbulence, the flight crew altered course and landed at Auckland, New Zealand at 1056 UTC. Visual meteorological conditions prevailed and the flight was operating on an instrument flight plan.

According to the Captain, the airplane was flying over a flat broken cloud layer with a smooth ride. He said, "Passing 25 degrees south at FL310 we noticed that the cloud tops were gradually rising. Radar showed very little - a few green returns off to the right. We were in an area of no forecasted turbulence or cumulonimbus cloud buildups. I turned on the seatbelt sign and made a passenger announcement, as it appeared we would soon be just above or in the cloud tops and I expected a few light bumps although the clouds looked benign. After entering the top of the cloud layer...we encountered 10 - 15 seconds of sharp severe turbulence with momentary over speed warning and stick shaker."

The captain said that he called the Purser and he was advised of flight attendant and passenger injuries. He contacted dispatch and was advised that he should divert to Auckland. After consulting with an onboard doctor and a company doctor in Chicago, the airplane diverted.

According to one of the flight attendants, he was assigned the position number 4 at door 3 left outboard. He said, "About 3 to 3 1/2 hours into the flight, the seat belt sign was illuminated. As per my duties, I went to check seat belts. When I reached row 59 on the left side of the plane, the pilot announced that flight attendants should be seated. At that moment, I sat down immediately on the floor between seats 59b and 59d. I held on to the bar under seat 59b. Within seconds, the plane started to go through very, very, violent turbulence. It started to fish tale...What I saw however was something totally different. Two flight attendants had started counting the merchandise in the duty free carts." He said he saw one of attendants counting the duty free merchandise was thrown to the left of the airplane along with the duty free cart. The other flight attendant near to the duty free cart was also injured. The duty free cart ended up upside down, and all the merchandise was strewn over the floor. The seriously injured flight attendant was struck by the duty free cart.

According to Digital Flight Data Recorder (DFDR) data, at 0628:58 a series of oscillating vertical and lateral accelerations began that lasted until 0630:38. The vertical accelerations (expressed in units of gravity or "g's", 1.0 is normal) ranged from a low of +0.31 to a high of +1.7. The lateral accelerations (a value of zero is normal) ranged from 0.119 left to 0.115 right. During the time frame of the encounter, the FMC reported winds went from 92 knots to 50, then back to 101. The indicated airspeed also varied from a pre-encounter average value of 315

knots to a peak of 344 before returning to the nominal 315 value.

The investigation reviewed the dispatch and flight release package provided to the flight crew. The weather forecast portion of the document noted that in the vicinity of 173 degrees east and 25 degrees south the upper air winds between 31,000 and 35,000 feet were forecast to be from 290 degrees at 102 to 113 knots. The document also noted the possibility of moderate or lesser turbulence from longitudes 164 degrees east to 172 degrees east along the planned flight track. Two SIGMETS were listed on the documents. The first, SIGMET AMMC MW01 (valid from April 30 at 2200 UTC to May 1 at 0400 UTC) forecast severe clear air turbulence between 25,000 and 35,000 feet, though the area concerned was some 900 nautical miles south and west of the accident location. The second one, SIGMET NTAA NR01 (valid on May 1 from 0200 to 0800 UTC) forecast isolated and embedded cumulo nimbus clouds with tops to 46,000 feet over a wide area well west and north of the planned flight track.

The National Weather Service Significant Weather Forecast Chart issued at 1700 UTC on April 30 and valid until 0600 UTC on May 1 showed a 120 knot jet stream and moderate or lesser clear air turbulence south of the accident location and an area of isolated cumulo nimbus clouds with tops to 40,000 feet to the north. No SIGMETS were in effect for turbulence.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial; Flight Engineer	**Age:**	58, 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	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	03/01/2002
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Co-Pilot Information

Certificate:	Airline Transport; Flight Engineer	**Age:**	52, 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):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With Waivers/Limitations	**Last FAA Medical Exam:**	03/01/2002
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N182UA
Model/Series:	747-422	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	25279
Landing Gear Type:	Retractable - Tricycle	**Seats:**	391
Date/Type of Last Inspection:	Continuous Airworthiness	**Certified Max Gross Wt.:**	875000 lbs
Time Since Last Inspection:		**Engines:**	4 Turbo Fan
Airframe Total Time:	48837 Hours	**Engine Manufacturer:**	Pratt & Whitney
ELT:		**Engine Model/Series:**	PW2040
Registered Owner:	United Airlines, Inc	**Rated Power:**	56000 lbs
Operator:	United Airlines, Inc	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	UALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	NZAA	**Distance from Accident Site:**	
Observation Time:	1100 UTC	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 2300 ft agl	**Visibility**	20 Miles
Lowest Ceiling:	Broken / 3500 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	15°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Sydney (YSSY)	**Type of Flight Plan Filed:**	IFR
Destination:	San Francisco, CA (SFO)	**Type of Clearance:**	IFR
Departure Time:	0353 UTC	**Type of Airspace:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 Minor, 19 None	**Aircraft Damage:**	None
Passenger Injuries:	5 Minor, 264 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 6 Minor, 283 None	**Latitude, Longitude:**	-24.300000, 174.333333

Administrative Information

Investigator In Charge (IIC):	RICHARD B PARKER	**Report Date:**	04/25/2006
Additional Participating Persons:	Robert Hendley; Federal Aviation Administration; San Francisco, CA		
Publish Date:			
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/.		