Aviation Investigation Final Report

Location:	Oakland, California	**Accident Number:**	WPR12LA053
Date & Time:	December 1, 2011, 19:53 Local	**Registration:**	N261WN
Aircraft:	Boeing 737-7H4	**Aircraft Damage:**	None
Defining Event:	Turbulence encounter	**Injuries:**	1 Serious, 2 Minor, 97 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

The flight was transitioning through an area of known severe turbulence. One of the flight attendants reported that the flight crew asked the cabin crew to secure the cabin early as they expected to encounter turbulence during the descent. Shortly thereafter, the airplane encountered severe turbulence and the flight attendants were thrown about the galley; one sustained a serious injury. The cockpit voice recorder contained audio that was not relevant to the flight (it was likely recorded over by subsequent events), thus it could not be conclusively determined when the flight crew asked the flight attendants to be seated because they could not recall. It is likely that the flight crew's request for the cabin to be secured was close to the time of the turbulence encounter, since none of the flight attendants had completed securing the service items when the encounter occurred. Synoptic conditions were favorable for mountain wave activity and a significant meteorological information (SIGMET) advisory and airmen's meteorological information advisories had been issued for turbulence over the region. The flight crew also had an advisory issued from their enhanced weather information systems for severe turbulence. The event occurred in the region that the SIGMET and the advisory for severe turbulence had been issued. According to the filed flight plan, the flight was to descend before entering the advisory area for weather avoidance; however, the planned descent was not followed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flight crew's flight into known severe turbulence associated with mountain wave activity.

Findings

Environmental issues	Clear air turbulence - Effect on personnel
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Enroute	Turbulence encounter (Defining event)

HISTORY OF FLIGHT

On December 1, 2011, at 1953 Pacific standard time, a Boeing 737-7H4, N261WN, flight 1489, encountered turbulence at flight level 30,000 feet (FL300), over Yosemite National Park, California. One flight attendant sustained serious injuries; 2 flight attendants received minor injuries; 2 pilots and 95 passengers were not injured. Southwest Airlines operated the flight under the provisions of 14 Code of Federal Regulations Part 121, as a scheduled-passenger flight that departed Albuquerque International Sunport Airport (ABQ), Albuquerque, New Mexico. An instrument flight rules (IFR) flight plan had been filed. The flight was destined for Metropolitan Oakland International Airport (OAK), Oakland, California.

According to Southwest Airlines, the airplane had been at FL400 and was descending to FL300 when the flight encountered severe turbulence. All three flight attendants were not seated when the turbulence was encountered. One flight attendant was in the forward galley and the other two flight attendants were in the aft galley. When the turbulence was encountered, the flight attendant in the forward galley was thrown up and down, and side to side with her feet leaving the cabin floor. She was able to hold onto a counter, and was eventually able to secure herself in the forward jumpseat. The two flight attendants in the aft galley were thrown around the aft galley and struck their heads and backs; they also were eventually able to secure themselves in their respective jumpseats and remained there throughout the landing. Both flight attendants were transported to the hospital via ambulance. One flight attendant was released with minor injuries. The other flight attendant was released from the hospital as well, and was informed the following day of the compression fracture of his vertebrae. There were no passengers transported to the hospital. According to statements from the flight attendants, they had been advised by the flight crew to secure the cabin early because the flight crew was expecting turbulence later in the descent. Statements from the flight crew indicated that the flight attendants had to be seated multiple times throughout the flight due to turbulence.

The captain reported that they had descended from FL400 to FL300 due to moderate turbulence. They were authorized to stop at any smooth altitude. The crew had continuous turbulence through FL320. At FL300, the ride was better, but shortly thereafter, they encountered abrupt and significant severe turbulence for approximately 10 seconds. The aircraft accelerated from .760 mach to .865 mach with vertical pitch change and associated yaw. They requested an immediate descent and checked on the status of the cabin crew and passengers. They were then advised of the injuries to the cabin crew. They declared an emergency and landed at Oakland where they were met by medical personnel.

In a statement submitted by the first officer, he reported that upon departure, they requested that the flight attendants remain seated until called. About 45 minutes after departure, the captain cleared the flight attendants to move around the cabin. The flight encountered additional turbulence, and the captain requested that the flight attendants take their seats. As the flight continued, it encountered intermittent moderate turbulence at FL400 and they requested a different altitude. The flight descended to FL300. All passengers were in their seats because the seatbelt sign was on, but the three flight attendants were not seated. The first officer could not recall the captain clearing the flight attendants from their seats.

According to statements submitted by the flight attendants, the flight crew informed the flight attendants that they were going to have them secure the cabin 35 minutes early due to projected turbulence. Shortly thereafter, the flight encountered severe turbulence. During the encounter, all flight attendants were lifted from the floor from the turbulence and unsecured service items were strewn about the galleys.

According to a statement from the dispatcher, the flight had been planned and filed to descend to FL260 prior to entering the area where the event occurred.

FLIGHT RECORDERS

The cockpit voice recorder (CVR) was examined. The recording consisted of four channels of audio information; however, none of the audio was pertinent to the incident/accident investigation. The audio was consistent with the CVR being overwritten or recorded over by subsequent events.

Data obtained from the flight data recorder (FDR) showed at 1931, the airplane was in level flight at 40,000 feet, and was experiencing vertical accelerations of about +/- 0.1g. At 1943:05, the aircraft descended to 30,000 feet. The flight management computer (FMC) computed wind speed showed a significant increase in wind speed at 30,000 feet compared to 40,000 feet. At 1953:21, when the airplane was level at 30,000 feet, it began experiencing vertical accelerations for about 13 seconds. During this period, the maximum negative and positive vertical accelerations were -0.18g and +3.52g, respectively.

METEOROLOGICAL INFORMATION

A Senior Meteorologist reviewed weather information pertinent to the flight. Synoptic conditions were favorable for mountain wave activity over California, and the National Weather Service had issued significant meteorological information (SIGMET) and airman's meteorological information (AIRMET) notices for turbulence over the region. Additional information was included in the flight crew's weather document from their enhanced weather information systems (EWINS) provider (SW45), which expected severe turbulence between FL300-420. The event occurred in the region that the SIGMET and SW45 had been issued. No visual sign of the turbulence other than some lower cap or lenticular clouds over the peaks

were noted, but visual meteorological conditions (VMC) prevailed at their location.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	52,Male
Airplane Rating(s):	Single-engine land; 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 Without waivers/limitations	**Last FAA Medical Exam:**	August 22, 2011
Occupational Pilot:		**Last Flight Review or Equivalent:**	September 15, 2011
Flight Time:	17210 hours (Total, all aircraft), 15710 hours (Total, this make and model), 13275 hours (Pilot In Command, all aircraft), 194 hours (Last 90 days, all aircraft), 63 hours (Last 30 days, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial	**Age:**	42,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
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 20, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 30, 2011
Flight Time:	8391 hours (Total, all aircraft), 4785 hours (Total, this make and model), 2450 hours (Pilot In Command, all aircraft), 123 hours (Last 90 days, all aircraft), 95 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Boeing	**Registration:**	N261WN
Model/Series:	737-7H4	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	32517
Landing Gear Type:	Retractable - Tricycle	**Seats:**	145
Date/Type of Last Inspection:	November 30, 2011 Continuous airworthiness	**Certified Max Gross Wt.:**	154500 lbs
Time Since Last Inspection:	79 Hrs	**Engines:**	2 Turbo fan
Airframe Total Time:	18350 Hrs as of last inspection	**Engine Manufacturer:**	CFM INTL
ELT:	Not installed	**Engine Model/Series:**	CFM56-7B24
Registered Owner:	SOUTHWEST AIRLINES CO	**Rated Power:**	24200 Lbs thrust
Operator:	SOUTHWEST AIRLINES CO	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	SWAA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MMH,7135 ft msl	**Distance from Accident Site:**	30 Nautical Miles
Observation Time:	19:55 Local	**Direction from Accident Site:**	93°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.14 inches Hg	**Temperature/Dew Point:**	-6°C / -15°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Albuquerque, NM (ABQ)	**Type of Flight Plan Filed:**	IFR
Destination:	Oakland, CA (OAK)	**Type of Clearance:**	IFR
Departure Time:	19:19 Local	**Type of Airspace:**	

Airport Information

Airport:	Oakland International Airport OAK	**Runway Surface Type:**	
Airport Elevation:	9 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Serious, 2 Minor, 2 None	**Aircraft Damage:**	None
Passenger Injuries:	95 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 Minor, 97 None	**Latitude, Longitude:**	37.729171,-122.24089(est)

Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye
Additional Participating Persons:	Brent Barker; FAA CMO; Dallas, TX Dennis Post; Southwest Airlines; Dallas, TX William Lusk; Southwest Airlines Pilot Association; Dallas, TX
Original Publish Date:	October 29, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=82465