Aviation Investigation Final Report

Location:	Pioneer, Louisiana	**Accident Number:**	CEN10LA363
Date & Time:	June 28, 2010, 17:52 Local	**Registration:**	N601DW
Aircraft:	Embraer EMB-145LR	**Aircraft Damage:**	None
Defining Event:	Turbulence encounter	**Injuries:**	2 Serious, 3 Minor, 40 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

The commercial flight was cruising at an altitude of 38,000 feet when the flight crew made a public announcement to the passengers (and a separate call to the flight attendant) that they may encounter turbulence, and the fasten seatbelt sign was turned on. The captain said they entered clouds and the flight was smooth for about 10 minutes when they noticed a very small red return (thunderstorm cell)on the radar about 5 miles in front of them. The crew did not have enough time to take evasive action and they penetrated the cell, encountering moderate rain with a strong updraft followed by one instance of a severe downdraft. The autopilot disengaged and the captain assumed control of the airplane. Shortly after, the flight attendant called on the interphone and said that she was assisting an elderly passenger in the lavatory when the upset occurred and they were both seriously injured. The captain immediately declared an emergency and landed without further incident. Weather Surveillance Radar (WSR) imagery identified a discrete cell of strong reflectivity values coincident with the airplane's position at the time of the turbulence event. A review of recorded weather data from two separate air traffic control centers handling the flight showed that moderate to extreme intensity precipitation existed ahead of the airplane for an extended period. However, the controllers did not recall seeing any displayed precipitation in the accident location, although they did recall seeing precipitation in other locations around the area. Review of display settings in use by the controllers showed no reason that the weather would not have been displayed, and there was no indication of a system malfunction. Review of ATC communications between the controllers and the flight crew revealed there were no discussions of the precipitation and thunderstorm activity ahead of the flight as required per Federal Aviation Administration (FAA) Order 7110.65, paragraph 2-6-4, "Weather and Chaff Services."

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The inadvertent encounter with convective weather during cruise flight. Contributing to the accident was the flight crew's failure to detect and avoid the thunderstorm cell earlier in the flight, and the failure of air traffic controllers to provide the convective weather information to the flight crew.

Findings

Personnel issues	Lack of communication - ATC personnel
Personnel issues	Weather planning - Flight crew
Environmental issues	Convective turbulence - Effect on operation

Factual Information

History of Flight

Enroute-cruise	Inflight upset
Enroute-cruise	Turbulence encounter (Defining event)

HISTORY OF FLIGHT

On June 28, 2010, approximately 1752 central daylight time, N601DW, an Embraer EMB-145LR, doing buisness as American Eagle flight 3224, encountered severe turbulence while in cruise flight at approximately 38,000 feet over Pioneer, Louisiana. The captain declared an emergency and landed without incident at East Texas Regional Airport (GGG), Longview, Texas, at 1824. The captain and the first officer were not injured, and the one flight attendant was seriously injured. Of the 42 passengers on board; one was seriously injured and three sustained minor injuries. The airplane was not damaged. The airplane was registered to and operated by American Eagle Airlines, Incorporated, Fort Worth, Texas. An instrument flight rules (IFR) flight plan was filed for the flight that departed Piedmont Triad International Airport (GSO), Greensboro, North Carolina, at 1605, and was destined for Dallas/Fort Worth International Airport (DFW), Dallas-Fort Worth, Texas. Instrument meteorological conditions prevailed for the scheduled passenger flight conducted under 14 Code of Federal Regulations Part 121.

In a written statement, the captain said that 10 minutes prior to entering the clouds he made a public announcement to the passengers and also a separate call to the flight attendant about the possibility of turbulence. The seat belt sign was turned on. He stated, "For about 10 minutes while flying in the clouds it was surprisingly smooth with not even light chop. There were no returns on the radar until about 20 seconds before the event. A very small red return was observed about 5 miles in front at our 12:30 position. Using tilt and range adjustments we were evaluating the return and discussing our actions. The event then occurred before any evasive action could be made. The event lasted less than 10 seconds and consisted of moderate rain with a strong updraft followed by one instance of a severe downdraft. The autopilot disengaged and I assumed control by hand flying the aircraft." The captain estimated they were out of the clouds in less than 10 seconds and returned to visual meteorological conditions. He said they had gained about 880 feet in altitude during the event and informed air traffic control that they were returning to their assigned altitude. Shortly after, the flight attendant called on the interphone and said that she and one other passenger were injured. The flight attendant, who was assisting an elderly passenger in the lavatory, stated she could not walk and the passenger was bleeding from the mouth. The captain immediately declared an emergency with air traffic control (ATC) and diverted to Longview, Texas, and landed without further incident.

In an interview, the captain reported that when he saw the small red return (less than a ¼-inch wide) on the radar, he zoomed in and was tilting the radar antenna to get a better reading on the cell. The radar was on manual gain and he felt that they were going to fly over the top of it. The cell was 5 miles directly in front of them or 30 seconds away. Shortly after, they encountered rain and the strong downdraft, which threw them up into their seatbelts. The captain stated that if he saw the cell at least 5 minutes beforehand he would have asked for a deviation since American Eagle's policy was to avoid cells by 20 miles.

The first officer provided a similar account of the accident. He stated that the radar, which was tilted down 5 degrees on variable gain, depicted an area of green precipitation in front of them and they were flying in and out of clouds. He then observed a red return on the radar about 2-3 miles in front of them, less than 20 seconds away. Before he and the captain could make a decision to deviate, they entered the clouds and it was smooth. Then it began to rain rapidly followed by a sudden gain in altitude and then a sudden drop in altitude. The entire event lasted less than 10 seconds.

The company also reported that at the time of the turbulence encounter, the autopilot disengaged and the captain immediately assumed control of the aircraft. After the event, the crew noticed they also lost the primary flight display (PFD) and multi-function display (MFD) on the first officer's panel and noticed an electrical smell in the cockpit. Once on the ground and after everyone had been assisted, the captain made an entry in the aircraft maintenance log regarding the severe turbulence event and the subsequent electrical smell. The airplane was examined and only a few burnt out bulbs were noted in the avionics panel; however, no structural damage was noted. The airplane was returned to service.

PERSONNEL INFORMATION

The captain, age 60, held an airline transport pilot (ATP) certificate for airplane multi-engine land and was type-rated in the EMB-145, SF-340, and ATR 42/72 airplanes. His last Federal Aviation Administration (FAA) First Class medical certificate was issued on March 17, 2010. He reported a total of 10,567 flight hours.

The first officer, age 31, held a commercial pilot certificate for airplane multi-engine land. His last FAA First Class medical certificate was issued on August 10, 2009. He reported a total flight time of 3,041 hours.

METEOROLOGIAL INFORMATION

The National Weather Service (NWS) Surface Analysis Chart issued at 1900 on the evening of the accident depicted a stationary front extending from Kentucky south-westward through western Tennessee, central Arkansas, and through the Dallas/Fort Worth area into central Texas. South of the front in the Louisiana/Mississippi region, surface models indicated winds were light (generally less than 10 knots) and variable; however, a southerly to easterly flow was evident. Several stations in the vicinity of the accident site reported more northeasterly flow at

the surface. Sky conditions were clear to partly cloudy in the region, and temperatures were in the mid-70°s to mid-80°s Fahrenheit (F). Dew point temperatures north of the Gulf Coast were in the low to mid-70°s F.

At 1748:43, the Weather Surveillance Radar (WSR)-88D Level-II base reflectivity "super resolution" imagery from Jackson, Mississippi, located approximately 80 miles east-southeast of the accident site, identified a discrete "cell" of strong reflectivity values (+50 dBZ) coincident with the airplane's position at the time of the turbulence event. As the airplane approached from the east, reflectivity values increased from "light" intensities (less than 25 dBZ) to more moderate intensities (45 dBZ) several minutes prior to the accident.

Airmen's meteorological (AIRMET) information issued and active for the accident time and location indicated no significant turbulence, icing or IFR conditions expected outside of convective activity. Between 1555 (approximately 2 hours before the accident) and 1755 (approximate accident time) there were nine convective significant meteorological (SIGMETs) information issued for the region. At the time of the accident, convective SIGMET 90C was active and advised of thunderstorms moving slowly with tops above 45,000 feet near the accident site.

A review of recorded data from the Weather and Radar Processors (WARP) at Fort Worth Center and Memphis Center showed that moderate to extreme intensity precipitation existed ahead of the airplane for an extended period. When interviewed, both controllers and supervisors stated that they did not recall seeing any displayed precipitation in the accident location, although they did recall seeing precipitation in other locations around the area. Review of display settings in use by the controllers showed no reason that the weather would not have been displayed, and there was no indication of a WARP or radar display system malfunction.

COMMUNICATIONS

According to FAA Order 7110.65, paragraph 2-6-4, "Weather and Chaff Services" , controllers are required to provide the following services (higher priority workload permitting):

a. Issue pertinent information on observed/reported weather and chaff areas. When requested by the pilot, provide radar navigational guidance and/or approve deviations around weather or chaff areas.

1. Issue weather and chaff information by defining the area of coverage in terms of azimuth (by referring to the 12-hour clock) and distance from the aircraft or by indicating the general width of the area and the area of coverage in terms of fixes or distance and direction from fixes.

The controller should use specific phraseology outlined in the Order to identify the location of the weather. Weather significant to the safety of aircraft includes such conditions as funnel

cloud activity, lines of thunderstorms, embedded thunderstorms, large hail, wind shear, micro bursts, moderate to extreme turbulence (including clear air turbulence), and light to severe icing.

Review of ATC communications between Fort Worth Center, Memphis Center, and the flight crew revealed there were no discussions of the precipitation and thunderstorm activity ahead of the flight.

CVR

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.

Pilot Information

Certificate:	Airline transport	**Age:**	60
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:**	March 17, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 18, 2010
Flight Time:	10597 hours (Total, all aircraft)		

Pilot Information

Certificate:	Commercial	**Age:**	31,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):		**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:**	August 10, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 19, 2009
Flight Time:	3041 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Embraer	**Registration:**	N601DW
Model/Series:	EMB-145LR	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	145046
Landing Gear Type:	Tricycle	**Seats:**	55
Date/Type of Last Inspection:	June 26, 2010 Continuous airworthiness	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	28747 Hrs at time of accident	**Engine Manufacturer:**	ALLISON
ELT:	Installed, not activated	**Engine Model/Series:**	AE3007C SER
Registered Owner:	AMERICAN EAGLE AIRLINES INC	**Rated Power:**	6442 Lbs thrust
Operator:	AMERICAN EAGLE AIRLINES INC	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	AEAA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	BQP,168 ft msl	**Distance from Accident Site:**	19 Nautical Miles
Observation Time:	17:29 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.8 inches Hg	**Temperature/Dew Point:**	37°C / 23°C
Precipitation and Obscuration:			
Departure Point:	Greensboro, NY (GSO)	**Type of Flight Plan Filed:**	IFR
Destination:	Dallas, TX (DFW)	**Type of Clearance:**	IFR
Departure Time:	16:05 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Serious, 2 None	**Aircraft Damage:**	None
Passenger Injuries:	1 Serious, 3 Minor, 38 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 3 Minor, 40 None	**Latitude, Longitude:**	32.731485,-91.432869(est)

Administrative Information

Investigator In Charge (IIC):	Yeager, Leah
Additional Participating Persons:	Chris Holmes; ALPA; Dallas, TX Jeff Rich; FAA; Oberlin, OH Nathan Enders; FAA; Fort Worth, TX William Shea; NATCA; Fort Worth, TX
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