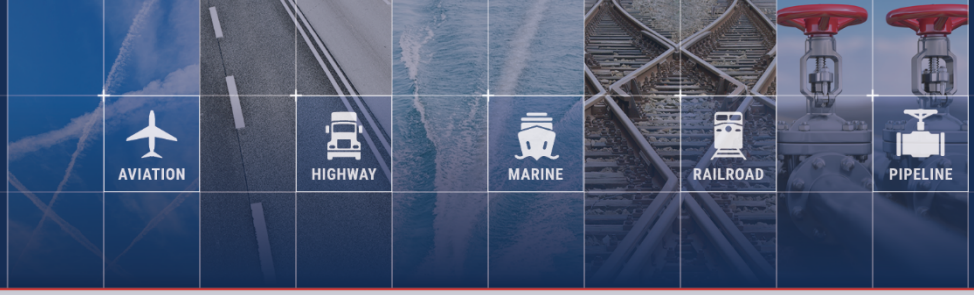

Aviation Investigation Final Report

Location:	Tuscaloosa, Alabama	**Accident Number:**	LAX08LA105
Date & Time:	April 4, 2008, 14:45 Local	**Registration:**	N900WP
Aircraft:	Raytheon Aircraft Company B300	**Aircraft Damage:**	Substantial
Defining Event:	Turbulence encounter	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

As the airplane entered the vicinity of the destination airport, the pilot observed a 200- to 300-foot-thick cloud ahead that looked as though it was precipitating virga. He noted that the base was about 500 feet above the airplane's altitude and appeared very dark. As the airplane passed under the dark cloud, at about 3,000 feet mean sea level, the flight immediately encountered a violent and rapid turbulence event. During the turbulence episode the airplane descended several hundred feet, but the pilot was able to maintain control. The pilot performed an uneventful landing and no damage was noted during the preflight inspection for the subsequent flight. Damage was noted during a later preflight inspection 4 days after the upset. An engineer from the airplane's manufacturer completed an evaluation of the damage incurred during the upset. He stated that the damage sustained by the left wing structure is indicative that the airplane experienced loads in excess of its design limits. A review of weather radar data indicated that a squall line was close to the airplane's location at the time of the upset. According to an analysis done by the Safety Board's meteorology specialist, the airplane most likely flew under either a "roll cloud" or a "shelf cloud." Although no exact magnitudes of shear velocities associated with roll or shelf clouds encountered could be determined, severe or extreme turbulence should always be expected in vicinity of these cloud types. In addition, the radial velocity and spectrum width data showed signatures of potential severe or extreme turbulence in the area where the airplane likely encountered the phenomena.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's encounter with severe turbulence during descent into the airport environment, which resulted in an exceedence of the aircraft's design stress limit and structural damage.

Findings

Environmental issues	Convective turbulence - Effect on equipment
Aircraft	(general) - Capability exceeded

Factual Information

History of Flight

Approach	Turbulence encounter (Defining event)

HISTORY OF FLIGHT

On April 04, 2008, about 1445 central daylight time, a Raytheon Aircraft Company (RAC) B300 King Air, N900WP, encountered severe turbulence and sustained substantial damage about 5 miles from the Tuscaloosa Regional Airport, Tuscaloosa, Alabama. Aviation Services Group was operating the airplane under the provisions of 14 Code of Federal Regulations Part 91, as a positioning flight. The airline transport pilot and second-in-command (SIC) were not injured. The flight originally departed from Shelby County Airport, Alabaster, Alabama, about 1430. Visual meteorological conditions prevailed and an instrument flight rules (IFR) flight plan had been filed.

An inspection by maintenance personnel on April 08, 2008, disclosed that the airplane had incurred damage to the wing skins and main spar. The damage was classified as substantial, and the event was upgraded to an accident on April 14, 2008.

Following the discovery of damage, written statements were submitted by the pilot-in-command (PIC) and SIC. The purpose of the flight was to position the airplane at Tuscaloosa, where they were to pickup passengers for a Part 135 operation. The PIC reported that while entering the vicinity of the destination airport, he observed a 200- to 300-foot-thick cloud ahead that looked as though it was precipitating virga. He noted that the base was about 500 feet above the airplane's altitude and appeared very dark.

The PIC further stated that as the airplane passed under the dark cloud they immediately encountered a violent and rapid turbulence event about 3,000 feet mean sea level (msl). He initiated a 180-degree turn while reducing power. During the turbulence episode the airplane descended several hundred feet and did not appear to have experienced any type of wing loading. He noted that he never experienced a loss of control of the airplane and the duration of the turbulence did not exceed several seconds. The PIC performed an uneventful landing and no damage was noted during the preflight inspection for the subsequent flight. The PIC further noted that the weather radar was turned off during the event, as the flight path was in visual meteorological conditions.

A Senior Field Engineer for RAC completed an evaluation of the damage incurred during the upset. He stated that the damage sustained by the left wing structure is indicative that the airplane experienced loads in excess of its design limits.

METEOROLOGICAL INFORMATION

Review of weather data by a National Transportation Safety Board meteorologist revealed that the high-resolution visible satellite data for 1432 and 1445 showed the leading edge of a squall line moving through the Tuscaloosa area during this time. A review of weather radar data indicated that the squall line was likely just east of the airplane's location at the time of the upset. The turbulence was likely convective in nature.

A Pilot Report (PIREP) was available for 10 nautical miles southeast of Tuscaloosa at 1452. The reporting pilot was at 2,300 feet msl when the airplane encountered moderate turbulence.

Doppler weather radar reflectivity data indicated a line of level 0-1 echoes just ahead of a line of level 4-6 thunderstorms approaching Tuscaloosa at 1445.

Although the pilots could not specifically remember the type of clouds they encountered during the flight, from their description and a review of pertinent data, the airplane most likely flew under either a "roll cloud" or a "shelf cloud."

A shelf cloud is a low-level arcus cloud that appears to be wedge-shaped as it approaches. It is normally attached to the thunderstorm base and forms along the gust front. It is usually associated with the leading edge of an approaching line of thunderstorms. No magnitudes of shear velocities could be found that were associated with roll or shelf clouds. However, severe or extreme turbulence should always be expected in vicinity of these cloud types. In addition, the radial velocity and spectrum width data showed signatures of potential severe or extreme turbulence in the area where the airplane likely encountered the phenomena.

A routine aviation weather report (METAR) for Tuscaloosa was issued at 1453. It stated: winds from 320 degrees at 25 knots gusting to 33 knots; 2 statue miles visibility; thunderstorms and rain with scattered clouds at 2,400 feet msl, broken clouds at 4,000 feet msl, and overcast conditions at 7,500 feet msl; temperature 68 degrees Fahrenheit; dew point 58 degrees Fahrenheit; and altimeter 29.86 inHg.

ADDITIONAL INFORMATION

According to the Aeronautical Information Manual (AIM), 7-1-14, "Turbulence should be expected to occur near convective activity, even in clear air. Thunderstorms are a form of convective activity that imply severe or greater turbulence. Operation within 20 miles of thunderstorms should be approached with great caution, as the severity of turbulence can be markedly greater than the precipitation intensity might indicate."

Pilot Information

Certificate:	Airline transport	**Age:**	49,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; 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 2 Without waivers/limitations	**Last FAA Medical Exam:**	June 5, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 16, 2008
Flight Time:	5978 hours (Total, all aircraft), 1758 hours (Total, this make and model), 5843 hours (Pilot In Command, all aircraft), 107 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	29,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):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	March 14, 2008
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 1, 2007
Flight Time:	2405 hours (Total, all aircraft), 319 hours (Total, this make and model), 1586 hours (Pilot In Command, all aircraft), 67 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Raytheon Aircraft Company	**Registration:**	N900WP
Model/Series:	B300	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	FL-496
Landing Gear Type:	Retractable - Tricycle	**Seats:**	11
Date/Type of Last Inspection:	March 27, 2008 AAIP	**Certified Max Gross Wt.:**	15000 lbs
Time Since Last Inspection:	21 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	604 Hrs	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-60A
Registered Owner:	MMM Acquisitions LLC	**Rated Power:**	1050 Horsepower
Operator:	Aviation Services Group	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	W1MA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	TCL	**Distance from Accident Site:**	
Observation Time:	14:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 2400 ft AGL	**Visibility**	2 miles
Lowest Ceiling:	Broken / 4000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	25 knots / 33 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	320°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.86 inches Hg	**Temperature/Dew Point:**	20°C / 14°C
Precipitation and Obscuration:	In the vicinity - Showers - Rain		
Departure Point:	Alabaster, AL (EET)	**Type of Flight Plan Filed:**	IFR
Destination:	Tuscaloosa, AL (TCL)	**Type of Clearance:**	IFR
Departure Time:	14:30 Local	**Type of Airspace:**	

Airport Information

Airport:	Tuscaloosa Regional Airport TCL	**Runway Surface Type:**	
Airport Elevation:	170 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	Visual
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	33.216667,-87.599998

Administrative Information

Investigator In Charge (IIC):	Keliher, Zoe
Additional Participating Persons:	Larry D Morrow; Federal Aviation Administration; Birmingham, AL
Original Publish Date:	February 25, 2009
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=67835