National Transportation Safety Board
Aviation Accident Final Report

Location:	Tulsa, OK	**Accident Number:**	DFW08FA056
Date & Time:	01/16/2008, 2243 CST	**Registration:**	N712AT
Aircraft:	AERO COMMANDER 500B	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

The commercial pilot departed on a night instrument flight rules flight in actual instrument meteorological in-flight conditions. Less than 2 minutes after the airplane departed the airport, the controller observed the airplane in a right turn and instructed the pilot to report his altitude. The pilot responded he thought he was at 3,500 feet and he thought he had lost the gyros. The pilot said he was trying to level out, and when the controller informed the pilot he observed the airplane on radar making a 360-degree right turn , the pilot said "roger." Three minutes and 23 seconds after departure the pilot said "yeah, I'm having some trouble right now" and there were no further radio communications from the flight. The on scene investigation disclosed that both wings and the tail section had separated from the airframe. All fractures of the wing and wing skin were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. The deformation of the wings indicated an upward failure due to positive loading. No anomalies were noted with the gyro instruments, engine assembly or accessories

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of control due to spatial disorientation and the pilot exceeding the design/stress limits of the aircraft. Factors contributing to the accident were the pilot's reported gyro problem, the dark night conditions , and prevailing instrument meteorological conditions.

Findings

Aircraft	Vacuum indicating system - Malfunction (Factor)
	Performance/control parameters - Not attained/maintained (Cause)
	Aircraft structures - Capability exceeded (Cause)
Personnel issues	Spatial disorientation - Pilot (Cause)
Environmental issues	Dark - Not specified (Factor)
	Below VFR minima - Not specified (Factor)

Factual Information

HISTORY OF FLIGHT

On January 16, 2008, at 2043 central standard time, a twin-engine Aero Commander 500-B airplane, registered as N712AT, was destroyed during an in-flight break-up and subsequent impact with terrain following a loss of control after take-off from Runway 36L at the Tulsa International Airport, near Tulsa, Oklahoma. The commercial pilot, sole occupant of the airplane, was fatally injured. The airplane was registered to and operated by Central Air Southwest, Inc., of Kansas City, Missouri, and was being utilized as an on demand air-carrier flight, hauling canceled bank checks. Dark night instrument meteorological conditions prevailed in the area at the time for the cargo flight conducted under 14 Code of Federal Regulations Part 135. An instrument flight rules flight plan had been filed and activated for the 94-nautical mile night cross-country flight from the Tulsa International Airport (TUL) to the Wiley Post Airport (PWA), near Oklahoma City, Oklahoma.

Authorities at the airport reported that soon after departing TUL, the pilot reported that he was having gyro problems. The airplane was observed on radar and was given instructions to turn left to 300 degrees. The pilot initiated a right turn and was informed by Tulsa approach control that "you are turning right, turn left to 300 degrees." The aircraft continued a steep right turn for two complete 360 degree turns and disappeared from the radar scope. The wreckage of the airplane was located about 90 minutes after the accident in a remote wooded area of Mohawk Park, approximately 1 3/4 miles north of the airport. There was no fire.

INJURIES TO PERSONS

The pilot was fatally injured. There were no injuries to anyone on the ground.

DAMAGE TO AIRCRAFT

The wreckage of the twin-engine airplane was located about 90 minutes after the accident in a remote wooded area of Mohawk Park, approximately 1.75 miles north of the airport (010 degrees from the departure end of the runway). There was no post-impact fire.

PERSONNEL INFORMATION

The 31-year old instrument rated pilot held a commercial certificate for single and multi-engine land airplanes. His last first class medical certificate was issued on November 19, 2007. The operator reported that the pilot had accumulated a total of 4,373-flight hours, of which 695-hours were in the same make and model aircraft. Additionally, the pilot was reported to have accumulated 255-hours in the preceding 90-days, with l83 in the last 30 days. The pilot's last biennial flight review was completed on November 29, 2007, in an Aero Commander 500-B.

The operator reported that the pilot was very familiar with the airplane and he had completed the scheduled flight almost on a daily basis since he joined the company.

AIRCRAFT INFORMATION

The 1961-model Aero Commander 500-B, serial number 1118-68, was reported to have accumulated a total of 17,888-flight hours at the time of its last inspection on January 10, 2008. The airplane has a maximum takeoff weight of 6,750-pounds, and the weight of the airplane at the time of takeoff from Tulsa was estimated at 6,005-pounds.

The aircraft was powered by two-290-horsepower IO-540-B1A5 Lycoming engines. The number one engine (left), serial number L-154-48, had accumulated a total of 126-hours since its last overhaul. The number two engine (right), serial number RL-7521-48, had accumulated a total of 1,276-hours since its last overhaul.

METEOROLOGICAL INFORMATION

The weather at the TUL airport at the time of the accident was reported as, a broken ceiling at 600 feet, an overcast ceiling at 1,900 feet, visibility 3 miles in rain and snow, temperature 31 degrees Fahrenheit, with winds from 300 degrees at 18 knots, gusting to 24 knots. The pilot was reported to have received a weather briefing for the flight.

COMMUNICATIONS

The Tulsa Air Route Traffic Control Center (ARTCC) personnel reported that at 45 seconds into the flight the pilot of N712AT, was cleared to climb to 6,000-feet and was given a left turn to a heading of 250-degrees, and cleared direct to PWA. The accident pilot acknowledged this transmission. At 1 minute and 59 seconds into the flight the controller noted that N712AT was in a right turn. At 2 minutes and 55 seconds the controller requested N712AT to report the altitude he was leaving and the pilot responded "3,500 I think I have lost my gyros, I'm trying to level out now". The controller responded "roger, you just made a right 360," to which the pilot responded "roger." At 3 minutes and 23 seconds after departure, the controller transmitted "712AT, you still appear to be in a right turn," to which the pilot responded "yeah, I'm having some trouble right now." At 3 minutes and 54 seconds the controller transmitted "712AT, I'm not getting a target on you, say altitude now." No response was received from the accident aircraft, and the accident airplane had disappeared from the radar scope. No further transmissions were received by the Tulsa ARTCC personnel.

WRECKAGE AND IMPACT INFORMATION

Examination of the aircraft wreckage was conducted at the accident site on January 18, 2008. The fractures were photographed and visually examined with a 10x magnifier and a high intensity light.

The first piece of aircraft wreckage along the debris field was the outboard portion of the left wing. The left wing was perched at a 45 degrees angle between two trees preventing extensive examination at its final resting place of North 36 degrees 13 minutes 7.51 seconds, West 95 degrees 53 minutes 4.46 seconds per the Tulsa Fire Department (TFD). All fractures of the wing structure (spars, longerons, and ribs) and wing skin were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. Overall deformation of the wing indicated failure upward due to positive loading.

The second piece of the aircraft wreckage found was the outboard portion of the right wing. The right wing was resting in a pile of broken tree limbs preventing extensive examination at its final resting place of North 36 degrees 13 minutes 8.54 seconds, West 95 degrees 53 minutes 5.54 seconds per the TFD. All fractures of the wing structure (spars, longerons, and ribs) and skin were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. Overall deformation of the wing indicated failure upward due to positive loading.

The empennage was found at North 36 degrees 13 minutes 8.64 seconds, West 95 degrees 53 minutes 5.74 seconds. The empennage was resting upright on its tail cone and its left and right

horizontal stabilizer tips. The empennage separated from the aircraft at the fuselage-empennage junction just forward of the vertical stabilizer. All fractures of the fuselage-empennage structure (stringers) and skin were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. Overall deformation of the fuselage-empennage junction indicated failure to the starboard side. The leading edges of the vertical stabilizer and the left horizontal stabilizer contained mechanical damage due to impact with the outboard portion of the right wing (detailed later). The bottom surface of the left horizontal stabilizer contained torsion buckles forward-aft indicating upward loading and the bottom surface of the right horizontal stabilizer contained torsion buckles aft-forward indicating downward loading. The left horizontal stabilizer upward loading and the right horizontal stabilizer downward loading indicates rolling of the aircraft from left to right which is characteristic of an in-flight breakup due to the right wing failing first.

The rudder was found approximately 20 yards north of the empennage. The rudder was fractured and folded in half. All the fractures of the rudder structure and skin were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. The rudder control cable (multi-strand spiral wound steel cable, encased in a protective dual spiral wound steel strip, and covered with a fiber reinforced protective coating) was failed and noted to have been in less than ideal condition (airworthy). The multi-strand spiral wound steel cable failed approximately 8 inches from the rudder. The failure mode could not be determined without the aid of a stereo/scanning electron microscope. The cable was uniformly rusted due to an apparent failure of the fiber reinforced protective coating in service. The protective dual spiral wound steel strip was pulled unwound approximately 3-feet in length due to the in-flight breakup of the aircraft. The protective strips were uniformly rusted like the cable due to an apparent failure of the fiber reinforced protective coating in service. The fiber reinforced protective coating was cracked in numerous places.

The fuselage/main body of the airplane came to rest at North 36 degrees 13 minutes 9.00 seconds, West 95 degrees 53 minutes 6.16 seconds on a magnetic heading of 343 degrees. The fuselage/main body of the aircraft was found in the inverted position and was pancaked into the soft terrain to a height of approximately 2-feet preventing extensive examination at its final resting place. Front to rear it consisted of the nose to approximately BS 292 and left to right it consisted of approximately LWS145 to RWS 98. All of the readily observable fractures of the left and right wing and empennage structures and skins were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. It should be noted that a majority of the fractures could not be visually examined on site due to pancaking into soft terrain.

Following visual examination of the outboard portions of the left and right wings at their final resting places, both wings were moved to a more suitable location for further examination. Overall deformation of both wings indicated failure upward due to positive loading. The leading edge and top portion of the right wing contained mechanical damage due to impact with the leading edges of the vertical and left horizontal stabilizers. This is characteristic of an in-flight breakup with the right wing failing, the aircraft rolling to the right, and the failed right wing impacting the vertical and left horizontal stabilizers as it goes up and over the aircraft.

The on-site investigation concluded that all of the fractures of the aircraft wreckage with exception to the rudder control cable were typical of ductile overload with no evidence of preexisting failures such as fatigue or stress-corrosion. Overall deformation and mechanical

damage of the aircraft wreckage is characteristic of an in-flight breakup. The failure and less than ideal condition of the rudder control cable warrants further examination to determine the mode of failure and its potential contribution to the in-flight breakup.

The aircraft was recovered to Air Salvage of Dallas for further investigation. On January 30, 2008, a wreckage review was conducted at the facilities of Air Salvage of Dallas, near Lancaster, Texas. The examination was conducted under the supervision of the Investigator-in-Charge. In attendance were representatives from Central Air Service, Parker-Hannifin, Commander Aircraft, the Federal Aviation Administration and Lycoming Engines.

Both engines were separated from the remains of the airframe. Both propellers remained connected to their respective crankshafts.

A detailed examination of the left engine was performed. All of the spark plugs, rocker covers, both ignition systems, and the engine driven fuel pump, were removed to facilitate the examination. The engine was rotated by hand and continuity was observed through out the rotating assembly. Valve train, camshaft, lifters, rocker arms, and accessory gears were observed to be moving as required. Thumb suction and compression was obtained from all of the cylinders during rotation. The cylinders were inspected using a lighted bore scope, no defects were noted.

A detailed examination of the right engine was performed. All of the spark plugs, rocker covers, both ignition systems, and the engine driven fuel pump, were removed to facilitate the examination. The right engine was rotated by hand and continuity was observed through out the rotating assembly. Valve train, camshaft, lifters, rocker arms, and accessory gears were observed to be moving as required. Thumb suction and compression was obtained from all of the cylinders during rotation. The cylinders were inspected using a lighted bore scope, no defects were noted.

The vacuum pumps, vacuum system components, both engine fuel flow dividers, and both engine propellers were retained by the NTSB IIC for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy and toxicological tests were requested and performed on the pilot. The autopsy was performed by the Office of the Chief Medical Examiner of the State of Oklahoma on January 17, 2008. The cause of death was determined to be the result of blunt force trauma. The toxicology tests were performed by the Civil Aero Medical Institute (CAMI) near Oklahoma City, Oklahoma. The toxicological report was negative.

TEST AND RESEARCH

A review of the radar data depicted the entire flight of the airplanes. The radar plot shows the airplane departing from runway 36L and initiates a left turn to a heading of 348 degrees.. The left turn continues up to 300 degrees, when the airplane enters a gradual right turn. The flight in effects completes a 360 degree turn while the ground speed continues to increase. The flight develops into what appears to be a tight right spiraling turn until ground impact is made. The maximum recorded ground speed during the flight occurred prior to ground impact , when 156 knots was recorded.

On February 5, 2008 the fuel flow dividers were examined at the facilities of Aircraft Fuel Injection Service of Dallas, near Dallas, Texas. These units were disassembled and examined. Nothing was observed during this examination that would have precluded these units from

functioning as required prior to impact.

The vacuum pumps were examined by the NTSB IIC, on February 12, 2008, at the facilities of Aircraft Accessories of Oklahoma. Inc., of Tulsa, Oklahoma. The examination of the vacuum pumps did not reveal any discrepancies that could have prevented normal operation at the time of the accident.

The check valve manifold, vacuum switches and vacuum regulators from the aircrafts vacuum system were transported to Nichols Airborne Division of Parker Hannifin examined and tested on February 12. No anomalies were noted that would have prevented normal operation.

Both propellers were examined on February 14, 2008, at the facilities of Bryan Propeller Service, near Fort Worth, Texas. A representative of the Hartzell Propellers, who attended the examination, concluded that both propellers were rotating and were at low blade angles at the time of the initial impact. There were no discrepancies noted that would preclude normal operation. All damage was consistent with impact damage.

ADDITIONAL INFORMATION

The wreckage was released to the owner's representative upon completion of the field portion of the investigation.

History of Flight

Initial climb	Flight instrument malf/fail
	Loss of control in flight (Defining event)
	Attempted remediation/recovery
	Aircraft structural failure

Pilot Information

Certificate:	Flight Instructor; Commercial	**Age:**	31, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With Waivers/Limitations	**Last FAA Medical Exam:**	11/19/2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	11/29/2007
Flight Time:	4373 hours (Total, all aircraft), 695 hours (Total, this make and model), 255 hours (Last 90 days, all aircraft), 83 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	AERO COMMANDER	**Registration:**	N712AT
Model/Series:	500B	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	1118-68
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	01/10/2008, AAIP	**Certified Max Gross Wt.:**	6750 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	17888 Hours at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO540-E1A5
Registered Owner:	Central Air Southwest	**Rated Power:**	290 hp
Operator:	Central Air Southwest	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)
Operator Does Business As:	Central Air Southwest, Inc.	**Operator Designator Code:**	ZJWA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	**Condition of Light:**	Night
Observation Facility, Elevation:	KTUL, 677 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	2246 CST	**Direction from Accident Site:**	150°
Lowest Cloud Condition:		**Visibility**	3 Miles
Lowest Ceiling:	Overcast / 800 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	18 knots / 21 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	300°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	0°C / 1°C
Precipitation and Obscuration:	Light - Freezing - Mist; Light - Freezing - Rain		
Departure Point:	Tulsa, OK (KTUL)	**Type of Flight Plan Filed:**	IFR
Destination:	Oklahoma City, OK (KPWA)	**Type of Clearance:**	IFR
Departure Time:	2240 CST	**Type of Airspace:**	

Airport Information

Airport:	Tulsa International Airport (KTUL)	**Runway Surface Type:**	
Airport Elevation:	677 ft	**Runway Surface Condition:**	
Runway Used:	N/A	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	36.225833, -95.889444

Administrative Information

Investigator In Charge (IIC):	William H Gamble	**Report Date:**	06/11/2009
Additional Participating Persons:	William J Witten; Federal Aviation Administration, FSDO; Oklahoma City, OK John Butler; Lycoming Textron; Arlington, TX Geoffrey Pence; Twin Commander; Arlington, WA Dan Scholtz; Parker Parker Hannifin; Elyria, OH John Towner; Air Central Southwest; Kansas City, MO Tom McCreary; Hartzell Propellers and Governors; Piqua, OH Andy McMinn; transportation Safety Institute; Oklajhoma City, OK		
Publish Date:	10/01/2009		
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/.		