Aviation Investigation Final Report

Location:	FERTILE, Minnesota	**Accident Number:**	CHI99FA223
Date & Time:	July 9, 1999, 17:22 Local	**Registration:**	N7314P
Aircraft:	Piper PA-24-250	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor was giving commercial instruction to the dual student, a private pilot, in the airplane. The airplane was seen flying at low altitude in the vicinity of the Fertile Airport. One witness saw the airplane come up out of the airport and turn south. He said he saw the airplane initiate a steep banked turn to the left, just over the trees. The witness said he looked away momentarily. When he turned back to the area where he saw the airplane, it was gone. Another witness was one mile east of the accident location when he saw the airplane. He said that he saw the airplane make a left, steep- banked turn, and then go down. The witness said that the airplane was low to the ground. The witness said the airplane was as high as a spray plane in a turn, after it makes a pass over a field. Examination of the wreckage revealed 3 inch long crack in the number 5 engine cylinder exhaust pipe, circumscribing the pipe approximately 1/4 inch to 1 inch beneath the flange where the pipe joined the cylinder. No other anomalies with the airplane were revealed. State Medical Examiner's Laboratory test results from the dual student pilot showed blood carbon monoxide to be 1.3 percent. The results of FAA toxicology testing of specimens from the dual student pilot were reported negative for all tests conducted. FAA toxicology results do not report carbon monoxide as positive until it reaches 10 percent. No carboxyhemoglobin tests were conducted on the instructor pilot due to blood contamination.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the inadvertent stall. Factors relating to this accident were the instructor pilot maneuvering the airplane at very low altitude and the trees.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: MANEUVERING

Findings
1. (C) STALL - INADVERTENT - PILOT IN COMMAND(CFI)
2. (F) ALTITUDE - LOW - PILOT IN COMMAND(CFI)
3. (F) OBJECT - TREE(S)
4. EXHAUST SYSTEM,MANIFOLD/PIPE - CRACKED
5. WING - SEPARATION

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On July 9, 1999, at 1722 central daylight time (cdt), a Piper PA- 24-250, N7314P, operated by an airline transport pilot, was destroyed while maneuvering 1 mile west-southwest of the Fertile Airport, Fertile, Minnesota. The airplane departed controlled flight, struck some trees and subsequently impacted the terrain. Visual meteorological conditions prevailed at the time of the accident. The instructional flight was being conducted under 14 CFR Part 91. No flight plan was on file. The flight instructor and dual student were fatally injured. The local flight originated at Fertile, Minnesota, at 1645 cdt.

The manager of the Fertile Airport said that he saw the airplane takeoff on runway 32 (3,002 feet by 60 feet, dry asphalt). He watched the airplane perform three to four standard traffic patterns and landings, the last landing being to a full stop. The manager said that he watched the airplane turn around on the runway and taxi down to the approach end of runway 31, to take off again. The manager said that he left the airport just as the airplane was taking off again. It was 1645 cdt. Prior to the accident, several witnesses saw the airplane operating in the vicinity of the Fertile Airport.

Two witnesses were traveling eastbound in a pick-up truck, 3 1/2 miles west of Fertile, when they saw the airplane. The driver of the truck estimated that he was 1/2 mile from the airplane when he saw it. He said the airplane was traveling from south to north. He described the airplane as being low to the ground and slow. The driver said that he only saw the airplane for two seconds before it went below the tree line. He estimated that it was approximately 1730 cdt when he saw the airplane.

The passenger in the truck said the airplane was about 1/2 mile in front of them when it came across the highway, heading north. The passenger said that the airplane was not very high above the ground. "It was just above the tree line; tree top high or a little bit above." Thinking that the airplane was a crop-dusting airplane, the passenger recalled commenting to the driver that he wondered what they (the airplane) were spraying out there. The passenger said the airplane was descending like a crop-dusting airplane, "like he was spraying, going over the wires and then dropping down". Then the airplane was gone. "We passed the point where we thought we saw the airplane go over, about 30 seconds later. We didn't see him again." The passenger said that the area that he thought the airplane went over was not a field or an area which looked like it would be sprayed.

Another witness working in a field just west of the accident site, said he saw the airplane come up out of the airport and turn to the south. He said he saw the airplane initiate a steep banked turn to the left just over the trees. The witness said he looked away momentarily to continue

his work. When his attention turned back to the area where he saw the airplane, the witness said the airplane was gone.

A fourth witness said that he was riding his motorcycle one mile east of the accident location, when he saw the airplane. He said that he saw the airplane make a left, steep-banked turn, and then go down. The witness said that the airplane looked just like a spray plane when it sprays a field. The witness said that the airplane was low to the ground. He said that the airplane was as high as a spray plane in a turn, after it makes a pass over a field.

The manager of the Fertile Airport said that when he returned to his home, he heard an emergency locator transmitter (ELT) signal going off over his scanner. He said that he immediately went to the airport and checked the airplanes on the ramp. It was 1730 cdt. A few moments later a Fertile police officer, responding to the ELT signal which they began receiving at 1722 cdt, arrived at the airport. The airport manager said that he and the officer began searching the area nearby the airport. The airport manager sighted the airplane from an east-west running dirt road, resting in a wooded area, a short time later.

PERSONNEL INFORMATION

The flight instructor held an airline transport pilot certificate with single and multi-engine land and sea, instrument airplane ratings, and commercial privileges for rotorcraft-gyroplane and glider-aerial tow airplane.

The flight instructor also held a certificate as a certified flight instructor (CFI) with privileges to instruct in single and multi-engine land, instrument airplanes, rotorcraft-gyroplanes, and gliders.

According to his most recent logbook, the instructor pilot had 4,444.2 total flying hours, with 2,567.4 hours in single-engine airplanes, and 12 hours in the PA-24. The instructor pilot had also logged 1,075.9 hours as a flight instructor.

The instructor pilot's biennial flight review coincided with the reinstatement of his flight instructor's certificate. An undated entry in his final logbook stated the instructor had been reinstated as a CFI. A renewed flight instructor certificate was issued by the FAA on May 27, 1999.

The dual student held a private pilot certificate with a single- engine land rating, and was working toward completing a non- instrument, commercial pilot certificate.

According to his logbook, the dual student had 313.7 total flying hours, all in single-engine land airplanes, and 33.3 hours in the PA-24.

The dual student successfully completed a biennial flight review on March 31, 1999, in a PA-24-260

AIRCRAFT INFORMATION

The airplane was owned and operated by Vic's Aircraft Sales, Fargo, North Dakota, and used in a rental capacity for flight instruction, business, and personal flying.

The airplane had undergone an annual inspection on June 6, 1999. The total airframe time recorded at the annual inspection was 5,433 hours. The tachometer reading at the annual inspection was 706.0 hours. The tachometer reading recorded at the accident site was 727.7 hours.

WRECKAGE AND IMPACT INFORMATION

The NTSB on-scene investigation began on July 10, 1999, at 1230 cdt.

The accident site was located in a heavily wooded area approximately 150 feet south of an east-west running gravel township road, and 75 feet east of a wheat field, with a standing crop. The ground in the immediate vicinity of the airplane's main wreckage was soft and muddy.

The airplane main wreckage, consisting of the fuselage, engine, propeller, right wing, inboard 8 feet of the left wing, and empennage was located at 47 degrees, 33.394 minutes north latitude, and 096 degrees, 18.266 minutes west longitude; 0.9 miles from the Fertile Airport on a 300 degree magnetic heading.

Preceding the airplane's main wreckage was a 100 foot tall, 18 inch diameter oak tree near the west edge of the wooded area. Several branches in the top portion of the tree were severed and broken. Several of the severed and broken branches were found at the base of the tree and fanning out from the tree along a 067 degree magnetic heading for approximately 25 feet.

A 30 inch long section of the airplane's left wing, containing the remains of the left auxiliary fuel tank, was located 11 feet from the base of the oak tree on a 140 degree magnetic heading. The wing section displayed a 6 inch wide, 12 inch deep "C" shaped dent in the leading edge and bottom skin, 2 inches in from the outboard fracture. The auxiliary fuel tank bladder was shredded. Vegetation beneath the wing section was discolored and withering.

The remaining outboard wing section, from the wing tip inboard 63 inches, was located in tall grass and shrubs, 35 feet from the base of the oak tree on a 220 degree magnetic heading. The wing section showed little damage. The taxi/landing light cover, just inboard of the wing tip, was broken out. The top forward section of the wing tip was broken inward.

The airplane main wreckage was located 95 feet from the base of the oak tree on a 070 degree magnetic heading. Between the oak tree and the main wreckage, along a 075 degree magnetic heading, several smaller hardwood trees were severed and broken at progressively lower heights proceeding to the main wreckage. The broken branches and severed tree trunks were

found resting on the ground along the 075 degree heading. The descending angle formed by tree damage, beginning with the top branches of the oak tree to the beginning of a ground scar at the main wreckage was approximately 45 degrees.

A ground scar, 31 feet long, 10 feet wide ground scar preceded the airplane and ran along a 067 degree magnetic heading. The ground scar was 20 inches at its deepest point which was at it's west edge, 22 inches in from the start of the scar, and 29 feet from the airplane. Pieces of plexiglass, a cockpit thermometer, paint flakes, pieces of cabin interior and insulation, headsets, pieces of windscreen frame, and several branches and tree trunks ranging from 1 inch to 8 inches in diameter, were found resting along the ground scar to the airplane.

The airplane rested upright on top of several scrub oak bushes and a few small hardwood trees. The airplane's fuselage was oriented on a 180 degree magnetic heading.

The airplane's propeller remained attached to the engine crankshaft at the flange. One of the two propeller blades was bent aft 45 degrees beginning 8 inches outboard of the hub. The blade showed several 12 to 20 inch long parallel scratches running longitudinally along the front face of the blade. The second blade was bent aft 15 degrees beginning 10 inches outboard of the hub. The spinner was crushed inward and conformed around the propeller hub.

The front 16 inches of the airplane's upper left, front cowling were bent aft. The top right front portion of the upper cowling was crushed inward. The left bottom cowling and nose gear doors were broken out and crushed. The right bottom cowling was crushed inward and broken open.

The airplane's engine was bent downward at the engine mounts. The top one-third of the firewall was bent forward. The airplane's nose gear was in the wheel well in the "up" position. It had been pushed aft and upward into the forward cabin. The front windscreen was broken out and fractured. The instrument panel was bent forward, canted 15 degrees to the left, and broken in several places along the top frame. Several flight, navigation, and engine instruments were crushed and broken out. The bottom of the instrument panel was crushed upward at the center where the nose gear had pushed upward through the front cabin floor. The cabin door frame was broken and bent forward. The cabin door remained attached to the frame at the hinges. The bottom outer skin was crushed inward. The window remained intact. The cabin door handle was in the "locked" position. The latch bayonet at the top of the door was extended.

The top of the airplane's cabin, from the windscreen to the just aft of the pilots' seats, was crushed inward and peeled outward and aft. Longitudinally-running mud smears were found beginning at the front edge of the cabin roof aft of the windscreen frame. The pilot's left side window was broken out. The left forward cabin wall at the left instrument panel was torn open and bent outward. The top of the cabin, aft of the pilots' seats was buckled outward and aft. The upper one-third of the rear cabin window was broken out. The left rear cabin window was

undamaged.

Fuselage skin at the left rear cabin bulkhead and just forward of the baggage compartment, was torn open, and bent upward and aft. The baggage door remained attached to the fuselage at the hinges.

The airplane's right wing was intact and attached to the fuselage. The right flap was flush with the wing and showed no damage. A 24 inch long, 14 inch wide, chordwise-running "V" shaped dent was found in the wing's leading edge, 8 feet outboard of the wing root. The leading edge from the dent outward to the wing tip was crushed aft approximately 8 to 10 inches and downward. An 8 inch wide, 13 inch deep "C" shaped dent was located just inboard of the longitudinal rivet line where the wing tip attached. The forward 12 inches of the right wing tip was crushed downward. The right aileron pressed upward against a small hardwood tree. It was bent upward and buckled along its entire span. Flight control continuity was confirmed to the right aileron. Both the right main fuel tank and the right auxiliary tank were undamaged. The right auxiliary tank was full of fuel. The right main landing gear was undamaged and partially extended approximately 15 degrees.

The remaining inboard 8 feet of the airplane's left wing was attached to the airplane's fuselage by the main wing spar. The spar was bent upward approximately 20 degrees, and aft 40 degrees at the wing root. The upper and lower wing skin at the fracture, where the outboard wing and left auxiliary fuel tank had broken off, was torn longitudinally along rivet lines just outboard of the left wing flap. The left main landing gear was fully extended and showed no damage. The top and leading edge skin of the inboard wing section was torn forward away from the fuselage.

The wing skin showed heavy mud smears running laterally across its surface. Grass, wood slivers, and leaves were found embedded in the wing skin tears. The left main fuel tank bladder was shredded. Approximately one-half gallon of fuel was recovered from a surviving inboard fold in the left main fuel tank bladder.

The left wing flap was found in an over-extended position. It was bent and buckled in several places along it's entire span. The left aileron cable was intact to the attach point of the aileron horn. The horn was broken off at its control surface mount. Flight control continuity to the left aileron was confirmed.

The airplane's fuselage, aft of the fracture at the rear cabin bulkhead, was bent to the left 45 degrees and canted 25 degrees counter-clockwise, when viewing the airplane from behind. From the fracture, aft to the tailcone, the fuselage showed some small skin wrinkles and buckles.

The airplane's vertical stabilizer, fin, and rudder showed no damage. The right horizontal stabilator was predominately intact save a 12 inch long, 1 1/2 inch deep section of the trailing edge, just inboard of the right stabilator tip. The trailing edge section was bent upward

approximately 10 degrees. The outboard 7 inches of the right edge of the stabilator trim tab was bent upward 15 degrees. The stabilator trim tab was aligned with the stabilator.

The left horizontal stabilator, 40 inches outboard of the tailcone, and the outboard 14 inches of the stabilator trim tab, were bent upward approximately 65 degrees. The tip of the left stabilator was broken off along the longitudinal rivet line. Flight control continuity to the rudder and stabilator were confirmed.

Examination of the airplane's engine revealed a 3 inch long crack in the number 5 cylinder exhaust pipe, circumscribing the pipe approximately 1/4 inch to 1 inch beneath the junction where the pipe joined the cylinder. No other anomalies were found relating to the engine. Examination of the airplane's engine controls and other systems revealed no anomalies.

A 3 inch long section of the number 5 cylinder exhaust pipe containing the cracked portion was removed from the engine and retained for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies of the instructor pilot and dual student were conducted by the Ramsey County Medical Examiner at St. Paul, Minnesota, on July 10, 1999.

Ramsey County Medical Examiner's Laboratory results from the examination of the student pilot showed blood carbon monoxide to be 1.3 percent. Additional blood samples from the student pilot were sent to the FAA Toxicology and Accident Research Laboratory, Oklahoma City, Oklahoma.

Ramsey County Medical Examiner's Laboratory results from the examination of the pilot showed blood ethanol and drugs serum screening were negative. A representative in the Ramsey County Medical Examiner stated that the pilot had suffered extensive chest trauma rendering blood at the heart muscle to be contaminated. A "2 to 4 milliliter" sample was taken from the instructor pilot's vein and was used to perform the "traffic screening" required by the State of Minnesota. This sample was destroyed during the testing. No additional blood samples were drawn from the instructor pilot. No blood was included in the sample from the instructor pilot sent to the FAA Toxicology and Accident Research Laboratory, Oklahoma City, Oklahoma.

The results of FAA toxicology testing of specimens received from the instructor pilot were negative for the tests conducted.

The results of FAA toxicology testing of specimens from the dual student pilot were negative for all tests conducted.

The manager of the FAA Toxicology and Accident Research Laboratory stated that they do not report carbon monoxide as positive until they read 10 percent.

TESTS AND RESEARCH

The exhaust pipe section was examined at the NTSB Material's Laboratory, Washington, DC, on October 14, 1999. The examination revealed that "the stack was formed by circumferentially welding a flat flange onto the straight pipe of the exhaust tube. In addition to the remnants of this original weld, the exterior surface of the exhaust tube contained evidence of numerous repair welds." The crack propagated through approximately half of the exhaust tube circumference. A magnified view of the piece showed that the entire crack path was confined to the beads of the repair weld. Examination of the interior surface of the tube revealed that the patch was welded over an old crack. "Subsequent examination of the piece with a scanning electron microscope revealed that the fracture faces on both cracks were still covered with a thick layer of deposits. X-ray energy dispersive spectra, generated at various locations along the fracture faces of both cracks contained iron, chromium, and nickel peaks, consistent with a 300-series stainless steel. In addition to the peaks of these elements, all spectra contained appreciable peaks of bromine, lead, and oxygen, typical of high temperature exhaust deposits. The thickness of the deposits and the extent of obliteration of the fracture features on the new crack were indicative that this crack in the stack was present for a relatively long time." The Materials laboratory factual report is attached as an addendum to this report.

ADDITIONAL INFORMATION

Parties to the investigation were the Federal Aviation Administration Flight Standards District Office, Minneapolis, Minnesota, the New Piper Aircraft, Incorporated, Monroe, Washington, and Textron Lycoming, Ardsley, Pennsylvania.

The aircraft wreckage was released and returned to the Fertile Airport, Minnesota.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	25,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land; Multi-engine sea	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Glider; Gyroplane	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Glider; Gyroplane; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	November 24, 1998
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	4444 hours (Total, all aircraft), 12 hours (Total, this make and model), 4195 hours (Pilot In Command, all aircraft), 29 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N7314P
Model/Series:	PA-24-250 PA-24-250	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-2490
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 12, 1999 Annual	**Certified Max Gross Wt.:**	2900 lbs
Time Since Last Inspection:	22 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	5455 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, aided in locating accident	**Engine Model/Series:**	O-540-A1C1
Registered Owner:	VICTOR GELKING	**Rated Power:**	250 Lbs thrust
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:	VICS AIRCRAFT SALES	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FSE ,925 ft msl	**Distance from Accident Site:**	22 Nautical Miles
Observation Time:	17:17 Local	**Direction from Accident Site:**	72°
Lowest Cloud Condition:	Scattered / 4400 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	12 knots / 16 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	17°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(14D)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	16:45 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	FERTILE AIRPORT D14	**Runway Surface Type:**	Asphalt
Airport Elevation:	1136 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	32	**IFR Approach:**	None
Runway Length/Width:	3002 ft / 60 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	47.530788,-96.289718(est)

Administrative Information

Investigator In Charge (IIC):	Bowling, David
Additional Participating Persons:	CHARLES CRARY; MINNEAPOLIS , MN KRIS WETHERELL; MONROE , WA DAVID C MOORE; ARDSLEY , PA
Original Publish Date:	November 30, 2000
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=46798