# National Transportation Safety Board
# Aviation Accident Final Report

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| **Location:** | JEFFERSON CITY, MO | **Accident Number:** | CHI99FA163 |
| **Date & Time:** | 05/27/1999, 1826 CDT | **Registration:** | N34TM |
| **Aircraft:** | Cessna 421B | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | | **Injuries:** | 4 Fatal |
| **Flight Conducted Under:** | Part 91: General Aviation - Business | | |

## Analysis

The airplane impacted the ground in a nose low, inverted attitude. The pilot reported, 'Jeff Tower, N34TM, I've just lost power on the right engine, eh, left engine.' The airplane's altitude was approximately 200 to 400 feet when the airplane's wings wobbled back and forth. The airplane's wings banked approximately 90 degrees to the left, and then the airplane nosed over and impacted the ground. White smoke was seen coming from the belly of the airplane for 1 to 2 seconds about 20 seconds prior to it impacting the ground. The terrain was a flat, hard packed field used for growing grass sod. Both the left and right propellers were found 12 to 18 inches under the hard packed soil. Rotational paint transfer patterns from the propeller blades onto the hard packed soil were evident. The left and right propeller blades exhibited chordwise scratching and leading edge polishing. The #2 cylinder piston was broken and the piston pin was still attached to the piston rod. The NTSB Materials Laboratory examination revealed the fracture face of the #2 exhaust valve stem was consistent with a bending fatigue separation. Both #2 and #6 exhaust valve guides showed heavy wear that ovalized the bores. The annual inspection conducted on March 15, 1999, indicated the compression on the left engine was 80/64, 50, 67, 70, 69, and 62.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the pilot failed to maintain control of the airplane. A factor was the partial loss of power due to the exhaust valve fatigue failure.

## Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
1. (F) ENGINE ASSEMBLY,VALVE,EXHAUST - FAILURE,TOTAL
2. ENGINE ASSEMBLY,PISTON - FAILURE,TOTAL
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Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

Findings
3. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND
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Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

## Factual Information

HISTORY OF FLIGHT

On May 27, 1999, at 1826 central daylight time, a Cessna 421B, N34TM, was destroyed when it impacted the ground approximately 1.6 miles northwest of the approach end of runway 12 at the Jefferson City Memorial Airport, Jefferson City, Missouri. The private pilot and three passengers received fatal injuries. The 14 CFR Part 91 flight had departed Poplar Bluff Municipal Airport (POF), Poplar Bluff, Missouri, at approximately 1730 en route to Jefferson City (JEF), Missouri. Visual meteorological conditions prevailed and the flight was on an IFR flight plan. The airplane was on the final segment of a visual approach to runway 12 when the pilot indicated he had a loss of power. The airplane was seen making a left turn to the northeast. It continued to roll and it impacted the ground in a nose low, inverted attitude.

Records indicate the pilot contacted the Federal Aviation Administration's (FAA) St. Louis Automated Flight Service Station (AFSS) at 1711 to obtain a weather brief and file a flight plan. The filed flight plan showed the flight was a direct flight from POF direct to JEF with a time en route of 45 minutes. Fuel on board was listed as 4.5 hours.

At 1820:09, N34TM contacted the JEF control tower. N34TM had been given a visual approach to runway 12 by approach control, and was instructed by the JEF control tower to enter the right traffic pattern for runway 12.

At 1823:24, N34TM reported entering the right downwind for runway 12. N34TM was sequenced as the number two aircraft for landing.

At 1824:20, N34TM acknowledged that he was cleared to land.

At 1825:47, N34TM reported, "Jeff Tower, N34TM, I've just lost power on the right engine, eh, left engine." No further radio transmissions were made by N34TM to the tower.

Witnesses reported seeing the airplane flying toward the airport. Then they reported seeing the airplane turn left to the north as it passed over highway 63. The witnesses reported the airplane's altitude was approximately 200 to 400 feet. They reported seeing the airplane's wings rock back and forth. They reported seeing the airplane wings banked approximately 90 degrees to the left. Then the airplane nosed over and impacted the ground.

One witness reported seeing white smoke coming from the belly of the airplane for one to two seconds. He reported seeing the airplane's wings wobble before it went into the sharp left bank. He reported it was approximately 20 seconds from the time that he saw the white smoke until it impacted the ground. He reported the landing gear was not extended.

One witness reported that he heard power being applied to the engines. He reported the airplane was in a left bank, and then it entered a "drastic upward climb" before nosing over and going straight down. He reported that he thought both engines were running.

The JEF airport manager, who was in the control tower at the time of the accident, reported the airplane, "... appeared to be north of the extended centerline and proceeding northbound at a low altitude. The aircraft appeared to be in a shallow left bank, and was approximately 1 mile northwest of the airport. The aircraft also appeared to level out once, but then returned to the shallow left turn, and continued to lose altitude. Within a few seconds the aircraft suddenly rolled into a steep left turn, (approximately 90 degrees) the nose pointed down to vertical, and

the aircraft descended behind the treeline. We then observed smoke from that location."

The witnesses reported the airplane burst into flames immediately after impacting the ground.

PERSONNEL INFORMATION

The pilot was a private pilot with single and multi-engine land ratings, and an instrument rating. He held a Third Class medical certificate. The pilot's flight logbook was not obtained. An insurance form dated March 9, 1999, indicated the pilot had approximately 1,850 hours of total flight time and 850 hours of time in make and model aircraft.

The pilot purchased N34TM in 1997. The total hours on the airplane when he purchased the airplane was approximately 5303 hours. The airplane had been flown approximately 227 hours since the pilot purchased the airplane.

AIRCRAFT INFORMATION

The airplane was a twin engine Cessna 421B, serial number 421B-0965. The airplane seated eight and had a maximum gross weight of 7,450 pounds. The engines were 375 horsepower Continental GTSIO-520-H engines. The last annual inspection was conducted on March 15, 1999. The airplane had flown about 35 hours since the last inspection and had a total time of about 5,530 hours.

The annual inspection conducted on March 15, 1999, indicated the compression on the left engine was 80/64, 50, 67, 70, 69, and 62. The right engine compression was 80/64, 64, 71, 62, 66, and 68.

The left propeller logbook indicated that on May 18, 1999, the left propeller was removed from the left engine for repair. The logbook indicated that nicks to one of the blades were filed and the propeller was balanced. The propeller was re-installed on the airplane on May 24, 1999.

METEOROLOGICAL CONDITIONS

The JEF weather at 1753 was reported as: Winds 000 at 6 knots, sky clear, visibility 10 miles, temperature 74 degrees Fahrenheit, dew point 46 degrees Fahrenheit, altimeter 30.10.

WRECKAGE AND IMPACT INFORMATION

The aircraft wreckage was located at coordinates N 42 degrees 36.786 minutes, W 92 degrees, 10.651 minutes. The location was approximately 1.6 nautical miles and 324 degrees from the approach end of runway 12. The terrain was a flat, hard packed field used for growing grass sod. The direction of the wreckage path was about 355 degrees. (See Wreckage Diagram and Photographs)

The left and right propellers were located at the initial impact site and were found on a line perpendicular to the wreckage path. The left propeller was found on the right side of the wreckage path, and the right propeller was found on the left side of the wreckage path. Both the left and right propellers were found 12 to 18 inches under the hard packed soil. Rotational paint transfer patterns from the propeller blades onto the hard packed soil were evident.

The left propeller blades exhibited chordwise scratching and leading edge polishing. The #3 blade exhibited blade polishing for more than a fourth of the blade. The #2 and #3 blade were bent aft.

The right propeller blades exhibited chordwise scratching and the #2 and #3 blades were bent

aft. The #1 blade tip was curled aft with a slight bend aft. Both #2 and #3 blades exhibited blade polishing.

The fuselage, cockpit, and the left and right wings were destroyed by fire. All flight controls were found attached to their respective hinges. Control cables were traced throughout the wreckage to their respective hinges. Cable fractures exhibited "broom straw" features.

The left and right wingtip fuel tanks had impacted the terrain on the same line as the propellers. Fan shaped burn patterns in the direction of the wreckage path emanated from the impact marks made by the wingtip fuel tanks.

The on-site examination of the left engine revealed that the number two cylinder spark plugs' electrodes were damaged. The number two cylinder piston was broken and the piston pin was still attached to the piston rod.

MEDICAL AND PATHOLOGICAL INFORMATION

The autopsy on the pilot was performed at Office of the Medical Examiner, Columbia, Missouri.

A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute. The report indicated the following results:

Carbon monoxide: Not performed

Cyanide: Not performed

No Ethanol detected in urine.

Ephedrine detected in liver fluid.

Pseudoephedrine detected in liver fluid.

Phenylopropanolamine detected in liver fluid.

Ephedrine detected in urine.

Pseudoephedrine detected in urine.

Phenylpropanolamine detected in urine.

Pseudoephedrine, ephedrine, and phenylpropanolamine are common ingredients in over-the-counter decongestants and diet pills.

TESTS AND RESEARCH

The left and right engines were examined at Teledyne Continental Motors. The inspection of the right engine revealed that it had received fire damage. No pre-existing engine deficiencies were noted.

The left engine examination revealed the following information:

1. Number two Piston part number SA 646303 was found broken. Pieces of this piston were recovered from the engine oil sump.

2. Number two piston pin aluminum plug ends were peened over.

3. Number 2 exhaust valve was broken at the lower stem to head transition area. The valve was part number AC 637781. Number two exhaust valve guide was checked with a go, no-go gage

and found to be worn oversized at the lower inside bore. The guide was removed from the cylinder and found to be part number AC 643767P010. The lower end (cylinder combustion chamber) was oblong. The valve guide I.D. measured .460 inch and .480 inch respectively. Per TCM overhaul manual, the exhaust valve to guide clearance should be .003 to .0047 inch. The valve clearance in this valve guide was from .028 inch to .048 inch loose. (See Teledyne Continental Motors Airsafety Investigation Report)

The left and right engine turbochargers were examined by Allied Signal Aerospace. (See Allied Signal Aerospace Teardown Report)

The left and right propellers were examined at McCauley Propeller Systems. (See McCauley Teardown Report)

The National Transportation Safety Board (NTSB) Materials Laboratory examined the following aircraft parts:

Left Engine: #2 and #6 cylinder exhaust valve and valve guides; turbocharger assembly; and turbocharger wastegate manifold.

Right Engine: Turbocharger assembly; turbocharger wastegate manifold; exhaust tail pipe with shield mounted to structure; and a fuel line section.

The inspection revealed the following:

1. The fracture face of the #2 exhaust valve stem was consistent with a bending fatigue separation. Multiple ratchet marks were visible on one side of the stem, consistent with the origination of the fatigue.

2. The constant-diameter portions of the #2 and #6 exhaust valve stems were measured. The maximum diameters (0.4335 inch) for both were at the tops near the valve spring retainer grooves. Toward the valve heads in the area of normal contact with the valve guides, the diameters on both stems decreased to minimum values (#2 0.4250 inch, #6 0.4225 inch) and then increased slightly.

3. Both #2 and #6 exhaust valve guides showed heavy wear that ovalized the bores. The minimum diameters at the hot ends of the guides were 0.452 inch for the #2 guide and 0.448 inch for the #6 guide. The maximum diameters on the hot ends of the guides were 0.477 inch for the #2 guide and 0.465 inch for the #6 guide. At the other end of the guides, the #2 and #6 bores appeared round and measured 0.442 and 0.441 inches in diameter.

4. The right turbocharger wastegate manifold had large portions missing from two sides, including a length of mounting flange. The fracture surfaces at the periphery of the missing piece were consistent with overstress forces. Deformation patterns adjacent to the fractures indicated that the overstressing forces were from the exterior on the one side and the interior on the other side, as if an outside object had completely penetrated through the manifold.

5. The examination of the short section of aluminum fuel line revealed the fuel line was circumferentially fractured at both ends and had about a one inch longitudinal split. Visual examinations of the fractures found them to be intergranular in nature and typical of overstress separations at elevated temperatures. The longitudinal split also had an intergranular path and appeared typical of overstress forces due to crushing deformation while at elevated temperatures. (See NTSB Materials Laboratory Factual Report)

Additional Information

Parties to the investigation included the Federal Aviation Administration, Cessna Aircraft Company, Teledyne Continental Motors, and McCauley Propeller Systems.

The aircraft wreckage and logbooks were released to Howe Associates, St. Louis, Missouri.

## Pilot Information

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| **Certificate:** | Private | **Age:** | 43, Male |
| **Airplane Rating(s):** | Multi-engine Land; Single-engine Land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 3 Valid Medical--w/ waivers/lim. | **Last FAA Medical Exam:** | 06/25/1998 |
| **Occupational Pilot:** | | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 1850 hours (Total, all aircraft), 850 hours (Total, this make and model) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Cessna | **Registration:** | N34TM |
| **Model/Series:** | 421B 421B | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | No |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 421B-0965 |
| **Landing Gear Type:** | Retractable - Tricycle | **Seats:** | 8 |
| **Date/Type of Last Inspection:** | 03/15/1999, Annual | **Certified Max Gross Wt.:** | 7450 lbs |
| **Time Since Last Inspection:** | 35 Hours | **Engines:** | 2 Reciprocating |
| **Airframe Total Time:** | 5530 Hours | **Engine Manufacturer:** | Continental |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | GTSIO-520-H |
| **Registered Owner:** | ROBERT E. LINVILLE | **Rated Power:** | 375 hp |
| **Operator:** | ROBERT E. LINVILLE | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual Conditions | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | JEF, 549 ft msl | **Distance from Accident Site:** | 1 Nautical Miles |
| **Observation Time:** | 1753 CDT | **Direction from Accident Site:** | 145° |
| **Lowest Cloud Condition:** | Clear / 0 ft agl | **Visibility** | 10 Miles |
| **Lowest Ceiling:** | None / 0 ft agl | **Visibility (RVR):** | 0 ft |
| **Wind Speed/Gusts:** | 6 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30 inches Hg | **Temperature/Dew Point:** | 23°C / 8°C |
| **Precipitation and Obscuration:** | | | |
| **Departure Point:** | POPLAR BLUFF, MO (POF) | **Type of Flight Plan Filed:** | IFR |
| **Destination:** | (JEF) | **Type of Clearance:** | IFR |
| **Departure Time:** | 1730 CDT | **Type of Airspace:** | Class D |

## Airport Information

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| **Airport:** | JEFFERSON CITY MEMORIAL (JEF) | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 549 ft | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 12 | **IFR Approach:** | |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | 3 Fatal | **Aircraft Fire:** | On-Ground |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | On-Ground |
| **Total Injuries:** | 4 Fatal | **Latitude, Longitude:** | |

## Administrative Information

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| **Investigator In Charge (IIC):** | JIM SILLIMAN | **Report Date:** | 08/14/2001 |
| **Additional Participating Persons:** | ERNIE JARVIS; KANSAS CITY, MO<br>EMILE LOHMAN; WICHITA, KS<br>DALE CARTER; MOBILE, AL<br>DAVE LOOPER; PHOENIX, AZ | | |
| **Publish Date:** | | | |
| **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/. | | |