Aviation Investigation Final Report

Location:	Miles City, Montana	**Accident Number:**	SEA02FA009
Date & Time:	November 4, 2001, 18:15 Local	**Registration:**	N8347T
Aircraft:	Cessna 175C	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During en route cruise, the number four cylinder exhaust valve guide separated from its associated cylinder head. When the aircraft was approximately 12 miles from the airport, the head of the number four cylinder exhaust valve separated from the valve stem. The exhaust valve head then dropped into the number four cylinder where it repeatedly impacted the piston dome and the cylinder head ceiling. This was followed by approximately 30 percent of the piston dome failing inward, resulting in the pressurization of the crankcase through the open exhaust valve port. As a result of the pressurization of the case, one of the number six cylinder pushrod-to-crankcase seals was forced off of its crankcase mounting surface, allowing the majority of the oil to escape from the engine. Soon thereafter, due to thermal stress, the number one connecting rod separated from the crankshaft and punched holes in the crankcase near the number one and number two crankshaft journals. After experiencing a total loss of power, the pilot attempted to land on the uneven rolling terrain, but due to the darkness of the night collided with the terrain.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The separation of the number four cylinder exhaust valve guide from the cylinder head, leading to the failure of the exhaust valve stem and the catastrophic failure of the engine while in cruise flight. Factors include the necessity of attempting a forced landing in rolling/hilly terrain on a very dark night.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CRUISE

Findings
1. (C) ENGINE ASSEMBLY,VALVE,EXHAUST - FAILURE,TOTAL

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING

Findings
2. (F) LIGHT CONDITION - DARK NIGHT
3. (F) TERRAIN CONDITION - MOUNTAINOUS/HILLY

Factual Information

HISTORY OF FLIGHT

On November 4, 2001, approximately 1815 mountain standard time, a Cessna 175C, N8347T, impacted the terrain during an attempted forced landing about 12 miles east of Miles City, Montana. The private pilot, who was the sole occupant, received fatal injuries, and the aircraft, which was owned and operated by the pilot, sustained substantial damage. The 14 CFR Part 91 personal cross-country flight, which departed Buffalo, South Dakota, about 75 minutes prior to the accident, was being operated in visual meteorological conditions. No flight plan had been filed. The ELT, which was activated by the impact, was turned off at the scene.

On the day of the accident, the pilot and a family member arrived at the Miles City Airport around 1430. After performing a pre-flight inspection, the pilot had a discussion with the owner of the maintenance shop that maintained the aircraft. During that discussion, the pilot expressed his desire to have a long-term ongoing oil leak problem permanently fixed, and the mechanic advised him that since other attempts to fix the leak had been unsuccessful, the engine would have to be removed from the aircraft for partial disassembly. About 1510, the pilot started the aircraft and taxied out for departure. After the pilot performed a pre-takeoff and engine run-up inspection, the flight departed for Buffalo, South Dakota, approximately 1520. The family member who accompanied the pilot on this leg of the flight, and individuals who where at the airport during the start-up and departure, said that they heard or saw nothing that would indicate that there was any problem with the engines performance.

The aircraft arrived at Buffalo around 1630, and according to the passenger who disembarked there, it departed for the return trip to Miles City around 1700. The passenger said that the pilot got out of the aircraft while it was parked on the ramp at Buffalo, but she could not remember whether he performed another walk around inspection prior to departure. The pilot then made his return flight to the Miles City area without contact with air traffic control services. Just prior to the accident, the pilot, who was approaching Miles City from the east after sunset, made a transmission indicating that he was 15 miles out for landing. At that time, he did not mention anything about having any trouble with the aircraft or its engine. One or two minutes later, he made a transmission stating that his engine was just about to quit. About the same time, witnesses who had heard the aircraft overhead noticed that the engine begin to make unusual noises. According to these witnesses, the engine began to run very rough, and then started making popping or backfiring sounds. At least two witnesses heard a loud bang. Soon thereafter, the engine went silent, and the aircraft started a descending spiral. During the descent, the landing or taxi light was turned on, and the aircraft eventually rolled out on a heading that took it toward a private grass airstrip located at geographic coordinates North 46 degrees, 23.737 minutes, West 105 degrees, 39.042 minutes. Within 60 seconds of hearing the engine go silent, witnesses heard the sound of the aircraft impacting the terrain. They then

immediately called 911 in order to notify authorities.

PERSONNEL INFORMATION

The pilot was a 45-year-old male, who held a private pilot certificate with an airplane single-engine land rating. He had accumulated approximately 220 hours of total flying time, and had accrued about 80 hours in this make and model aircraft. He had flown nine hours in the 90 days prior to the accident, and he had completed a flight review on September 17, 2000. His class three medical, which required him to wear corrective lenses while flying, was dated 08/25/00.

METEOROLOGICAL INFORMATION

The 1753 surface aviation weather observation (METAR) taken at the Miles City Airport indicated that the skies were clear, with 10 miles visibility, winds 130 degrees at six knots, a temperature of 55 degrees Fahrenheit, a dew point of 21 degrees, and an altimeter setting of 30.03 inches of mercury.

According to witnesses, at the time of the accident, there were no clouds in the sky, and it was a very dark night. One witness said that with no moon visible it was very hard to make out the outline of the terrain around his property. At the Miles City Airport, twilight ended at 1716, and moonrise was not expected to occur until 1830.

WRECKAGE AND IMPACT INFORMATION

The aircraft impacted the terrain about 12 miles east of the Miles City Airport, about 1 mile south of State Route 12, and one-half mile west of the unlighted Mullen private airstrip. The geographic coordinates of the accident site were North 46 degrees, 23.730 minutes, West 105 degrees, 39.174 minutes. The site was on lightly populated undeveloped grassy rolling terrain. Most of the surrounding terrain was sparsely treed, and contained occasional open fields. The initial impact mark was on relatively flat terrain, but the majority of the impact track ran on a magnetic heading of 060 degrees up gently rising terrain. The main wreckage came to rest a distance of 110 feet past the initial impact mark. Approximately 30 feet past the initial scar was a shallow two foot-wide impact crater approximately eight feet long. From that point to where the aircraft came to rest, there were no additional ground scars. Except for the muffler and the left main tire and wheel assembly, the entire aircraft was at one location at the end of the wreckage track. The left main tire/wheel assembly was located 35 feet down-track and 80 feet left, and the muffler was located 95 feet down-track and 10 feet left.

The fuselage cabin area was distorted and deformed, and the lower portion of the firewall had been pushed aft. The left control yoke shaft was broken off, and the pilot's seat had deformed to the right. The left front seat inner seat belt attachment was broken out. The pilot's seat belt, which had been cut by emergency personnel, was still buckled. The pilot was not wearing a

shoulder harness. The cabin area had been cut open in order to rescue the pilot, and the individuals who extracted the pilot had forced the left wing up over the fuselage. The left main gear strut and nose gear strut had separated, and were lying near the main wreckage. The fuselage had ripped open just aft of the baggage compartment, and the area aft of that rip, to include the entire empennage, was essentially intact. There was an extensive amount of oil inside of the lower engine cowling and on the belly. The oil flow pattern on the engine exterior and inside the engine compartment emanated from the area around where the number six cylinder pushrod tube-to-engine case seal had moved away from the case by about one and one-half inch. Although some of the oil on the belly showed evidence of dirt accumulation over a period of time, most of the oil appeared fresh, was uncontaminated by ambient dirt and dust, and was dripping in long steams down the side of the fuselage. Elevator, rudder, and aileron control continuity was established from the individual flight control to the front portion of the aircraft cabin. The trailing edge of the elevator trim tab was up about 1.7 inches. A two-foot section of the left wing, just outboard of the aileron, was bent downward about 30 degrees, and the most outboard three feet of the wing had been crushed aft and up on about a 30 degree angle. The most outboard four feet of the right wing had been crushed aft about three or four inches, and this same section was bent upward about 10 degrees.

The engine, a Teledyne Continental GO-300-E, had partially separated from its mount and was lying inverted in front of the firewall. The propeller was still attached, and engine control continuity was established to the cabin. The most outboard 18 inches of one propeller blade was bent back about 70 degrees, and the other blade was bent back about 50 degrees from a point 12 inches outboard from the hub. Neither blade showed evidence of chordwise scarring, leading edge indentations, or S-curving. The carburetor was disassembled and there was no evidence of contamination or any anomalies that would have contributed to a loss of engine power. The finger screen was clean. The interior of the mufflers were intact, and there was no evidence of disintegration or leakage. There was no evidence of excessive lead build-up or contamination on the spark plugs.

There were two holes in the upper rear crankcase above the number one and number two crankshaft journals. An internal teardown examination revealed that the number four cylinder exhaust valve guide had separated from the cylinder head, fractured into three primary pieces, and dropped into the oil sump. The exhaust valve guide insert hole was enlarged, and the exhaust valve was broken at the head-to-stem transition area. The stem, which was found lying across the rocker pin, showed no signs of lack of lubrication or thermal stress. The fracture areas on the valve stem and head were badly mutilated from repetitive impact forces. Portions of the number four cylinder intake valve head had broken off, and the three sections of the number four cylinder rocker pin boss had all fractured. The entire area of the piston dome was dented and deformed from a massive number of repetitive impacts. The center 30 percent of the piston dome had separated inward and was found in pieces in the oil sump. The number one connecting rod bearing showed discoloration and thermal stress signatures consistent with a lack of lubrication. The bearing had been partially extruded, and the connecting rod bolt had fractured allowing the connecting rod to release from the crankshaft. The area of the crankcase directly opposite the number one cylinder showed extensive repetitive impact

damage, and there was a two-inch by three-inch hole in the case just above the damaged area. The number one crankshaft journal also showed evidence of thermal stress and was galled and blackened. The number two connecting rod bearing showed evidence of lack of lubrication and thermal stress, but to a lesser degree. Small portions of the number four piston were found throughout the engine oil system, and the camshaft lobes had been coated with aluminum debris. The valves in all other cylinders where inspected and appeared normal.

An inspection of the in-hangar parking spot of this aircraft revealed that it had been experiencing an ongoing engine oil leak. According to family members and the maintenance personnel at the airport, the pilot was aware of the leak and had been actively checking the oil level and filling the engine to the appropriate level on a regular basis. There were eight full quart-size oil containers found in the aircraft. There were several empty oil containers in the hanger, and a number of both empty and full oil containers were found in the pilot's truck. According to the primary maintenance provider (Settle Aviation), the aircraft had been leaking a small but steady amount of oil for some time. Although attempts had been made to find and stop the leak, such actions had been only partially successful. According to the maintenance provider, the pilot had been advised that the next step was to remove the engine from the aircraft and disassemble it to the level that would reveal the source of the leak.

According to Settle aviation, the pilot had recently reported that the aircraft was beginning to run rough when it was first started from a cold condition, but that after it warmed for awhile, it ran strong and smooth. Although the aircraft engine and airframe log books were not located, a review of Settle Aviation records showed that the number one cylinder assembly had been replaced on 7/8/01 after the pilot reported a rough running engine after startup. At that time, maintenance personnel discovered a stuck valve and made the decision to replace the cylinder. At the same time, the generator and tachometer drive seals were replaced in an attempt to reduce oil leakage.

ADDITIONAL DATA AND INFORMATION

The aircraft wreckage, except for the engine and engine subsystems, was released to Brad Hernke, a representative of USAIG, on November 29, 2001. After a teardown inspection, the engine was released to Mr. Hernke on March 29, 2002.

Dr. C. T. Pezzarossi, M.D., completed an autopsy on the pilot, and the results indicated the death was accidental, with the cause being multiple injuries secondary to an aircraft accident.

The FAA's Toxicology and Accident Research Laboratory subjected samples taken from the pilot to a forensic toxicology examination. Results from that examination indicated no carbon monoxide or cyanide detected in the blood, and no ethanol or screened drugs detected in the urine.

Pilot Information

Certificate:	Private	**Age:**	45,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	August 25, 2000
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 17, 2000
Flight Time:	220 hours (Total, all aircraft), 80 hours (Total, this make and model), 9 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N8347T
Model/Series:	175C	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	17557047
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	December 30, 2000 Annual	**Certified Max Gross Wt.:**	2450 lbs
Time Since Last Inspection:	84 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2450 Hrs	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	GO-300-E
Registered Owner:	Terry I. Stubblefield	**Rated Power:**	175 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	KMLS,2628 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	20 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	130°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	13°C / -6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Buffalo, SD (9D2)	**Type of Flight Plan Filed:**	None
Destination:	Miles City, MT (MLS)	**Type of Clearance:**	None
Departure Time:	17:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	46.220645,-105.600791(est)

Administrative Information

Investigator In Charge (IIC):	Anderson, Orrin
Additional Participating Persons:	Edward Warmoth; FAA FSDO
Original Publish Date:	October 24, 2002
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=53734