Aviation Investigation Final Report

Location:	Pine Bluff, Arkansas	**Accident Number:**	CEN16FA210
Date & Time:	June 8, 2016, 17:00 Local	**Registration:**	N6649E
Aircraft:	Cessna 175	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Fatal, 1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The passenger reported that, about 15 minutes after takeoff on the cross-country flight, the engine began "stalling in and out." Although the pilot attempted to troubleshoot the issue, he could not remedy it, and selected a dirt road as a forced landing site. The passenger stated that the airplane was too fast and too high to land, and the pilot circled the airplane for a second approach. About 150 feet above the ground, the engine experienced a total loss of power. The airplane touched down in an area of tree stumps and immediately nosed over.

Toxicology testing of the pilot revealed the presence of diphenhydramine; however, the level detected was too low to quantify and was unlikely to be impairing. No shoulder harnesses were installed, and their installation was not required. Advisory Circular 91-65, in part, stated, "The [National Transportation Safety Board] concluded that shoulder harness use is the most effective way of reducing fatalities and serious injuries in general aviation accidents."

Although the spark plugs displayed significant wear, a test run of the engine revealed no anomalies that would have precluded normal operation. A carburetor icing probability chart showed the airplane was operating in conditions conducive to serious icing at glide power; however, the airplane should not have been susceptible to carburetor icing at the cruise power setting at which it was operating. The investigation could not determine a reason for the loss of engine power.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:
A loss of engine power during cruise flight for reasons that could not be determined because a test run of the engine did not reveal any mechanical malfunctions or anomalies that would have precluded normal operation. Contributing to the accident were the tree stumps at the forced landing site.

Findings

Not determined	(general) - Unknown/Not determined
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

History of Flight

Enroute	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Collision with terr/obj (non-CFIT)
Landing-landing roll	Nose over/nose down

On June 8, 2016, about 1700 central daylight time, a Cessna 175 airplane, N6649E, nosed over during a forced landing following an inflight loss of engine power near Pine Bluff, Arkansas. The private pilot was fatally injured and the passenger sustained minor injuries. The airplane was substantially damaged. The airplane was owned by Shepard Group LLC and was operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Day visual meteorological conditions prevailed at the time of the accident and no flight plan was filed. The flight departed from the Star City Municipal Airport (55M), near Star City, Arkansas and was destined for the Mena Intermountain Municipal Airport (MEZ), near Mena, Arkansas.

A Trooper from the Arkansas State Police interviewed the passenger while the passenger was in the hospital. The passenger stated that the airplane was "loaded up" and it took off northwest bound from 55M. The airplane was about 4,800 feet and "everything was going good." About "15 or 20" minutes after takeoff, the engine started "stalling in and out." The RPMs were going "up and down." The pilot tried to troubleshoot the power issue and was not able to remedy it. The pilot turned the airplane around and attempted to return to 55M. The pilot determined that the flight could not make it back and they started looking for a dirt road to land on. A road was found. However, the airplane was going too fast and was too high, so the pilot attempted to circle back around. About 150 feet off the ground, the "engine cut out and the prop quit." The pilot tried to set the airplane down in an open field with clear-cut tree stumps present. The airplane landed and it immediately nosed over.

Residents near the accident site saw the airplane overhead. They heard the airplane engine sputtering and saw it descending. A witness drove out, saw the airplane inverted, and called 911.

Pilot Information

Certificate:	Private	**Age:**	66,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	February 26, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 21, 2016
Flight Time:	(Estimated) 147 hours (Total, all aircraft)		

The 66-year-old pilot held a Federal Aviation Administration (FAA) private pilot certificate with an airplane single engine land rating. He also held a FAA third-class medical certificate that was issued on February 26, 2016, with a limitation that he must wear corrective lenses. Copies of pilot logbook excerpts obtained by the FAA did not have the pilot's recorded flight experience totalized. However, the pilot reported on his application for his medical certificate that he accumulated 147 hours of total flight time with 0 hours in the six months preceding his medical. The medical indicated the pilot was 76 inches tall. An endorsement in the pilot logbook excerpts showed that the pilot completed a flight review on April 21, 2016.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N6649E
Model/Series:	175	**Aircraft Category:**	Airplane
Year of Manufacture:	1959	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	56149
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	October 6, 2015 Annual	**Certified Max Gross Wt.:**	2350 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	2247.2 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91A installed, not activated	**Engine Model/Series:**	GO-300-A
Registered Owner:	On file	**Rated Power:**	175 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

N6649E, a Cessna 175, Skylark, serial number 56149, was an externally braced high-wing, propeller-

driven, fixed landing gear, semi-monocoque design, four-seat airplane. A 175-horsepower, geared, six-cylinder, air cooled, horizontally opposed, carbureted, Continental GO-300-A engine, marked with serial number 6208-9-A, powered the airplane. The propeller was a two-bladed, all-metal, fixed pitch, McCauley model 1B175/MFC8460, with serial number 70765.

Copies of airplane logbook excerpts obtained by the FAA showed that an annual inspection was completed on October 6, 2015. An endorsement in the logbooks indicated the airplane had accumulated 2,247.2 hours of total time and the tachometer indicated 0.0 hours at the date of the annual inspection.

Fueling records indicated the airplane was serviced with 17.0 gallons of 100 low lead aviation fuel at MEZ on June 6, 2016, and was topped off with 14.5 gallons of 100 low lead aviation fuel at MEZ on June 7, 2016.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KPBF,214 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	16:53 Local	**Direction from Accident Site:**	75°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	110°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.95 inches Hg	**Temperature/Dew Point:**	31°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	STAR CITY, AR (55M)	**Type of Flight Plan Filed:**	None
Destination:	MENA, AR (MEZ)	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

At 1653, the recorded weather at the Grider Field Airport, near Pine Bluff, Arkansas, was: Wind 110 degrees at 6 knots; visibility 10 statute miles; sky condition clear; temperature 31 degrees C; dew point 19 degrees C; altimeter 29.95 inches of mercury.

The temperature and dew point were plotted on a carburetor icing probability chart. The intersection of the temperature and dew point was within the serious icing-glide power envelope.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Minor	**Latitude, Longitude:**	34.116111,-92.210556

The airplane was found inverted about 24 miles and 305 degrees from 55M in an open area of rolling land with clear-cut tree stumps present. The first found witness mark was a ground scar consistent with a width of a landing gear tire, which was observed next to a tree stump that had an indented witness mark. The inverted wreckage was found about 40 feet and 120 degrees from that stump. A ground scar depression consistent with the shape of the cowling was observed about 20 feet from that stump in the same direction to the wreckage.

A FAA inspector found the fuel selector handle in the BOTH tank position shortly after arriving at the accident site and moved it to the OFF position. A picture of the fuel selector revealed its securing cotter pin was partially engaged. A subsequent on-scene examination of the wreckage was conducted. Flight control cables were traced from the cockpit controls to their respective flight control surfaces and flight control cable continuity was established. The wing flaps were found in the 10-degree extended position and flap control cable continuity was established. Measurement of the elevator trim actuator extension was 1.25 inches, which was consistent with a neutral elevator trim tab position. Engine controls were moved in the cockpit and engine cable continuity was established when their opposite ends moved respectively. The carburetor was found separated from its engine mounting surface. The propeller remained attached to the engine's propeller flange and the propeller did not exhibit any leading edge nicks. The vacuum pump separated from its mounting pad. The fuel line to the carburetor was separated at its carburetor inlet fitting. The carburetor, below the fuel inlet fitting area, was discolored consistent with the color of sooting. The carburetor was disassembled and its floats were found loose in the float chamber, where the float's attaching solder had a shiny appearance consistent with being melted. The firewall fuel strainer was deformed and discolored consistent with the color of sooting. The strainer's screen was found unobstructed and its glass bowl was found broken. The tachometer indicated 28.12 hours.

The fuel tank selector valve was removed and it operated normally in all its positions. Both the left and right fuel tanks inflated when shop air was applied to the respective fuel tank's line coming from the fuel tank selector valve. Fuel was noted exiting from left tank's vent tube when the shop air was applied to the left fuel tank's line. Shop air was applied to the fuel strainer's fuel line coming from the fuel tank selector valve and air was observed exiting from the fuel strainer.

The airplane was placed in an upright position, defueled, and disassembled. The right fuel tank contained less than a quart of blue colored fluid and the left fuel tank contained approximately 11 gallons of blue colored fluid, which tested negative for water contamination. During disassembly, the left fuel tank vent cross over nipple was found to be obstructed. The left fuel tank filler neck cap was an unvented type cap. The front seats remained attached to their seat tracks with their locking pins engaged in their tracks. Removed engine spark plugs were "worn out normal/severe" when compared to the

Champion Check-A-Plug chart. A borescope examination of the cylinders revealed that all valves were intact and with normal combustion signatures. A liquid consistent with oil was observed on the oil dipstick when it was removed from its holder. There were no installed shoulder harnesses observed in the airplane. The airplane was removed by a recovery company and the airplane's engine and propeller along with the airplane's right fuel tank filler neck vented fuel cap were subsequently shipped to the engine manufacturer for testing.

Medical and Pathological Information

An autopsy was performed on the pilot and toxicological samples were taken by the Arkansas State Crime Laboratory. The pilot's cause of death was listed as scattered superficial blunt force injuries.

The FAA Civil Aerospace Medical Institute (CAMI) prepared a Final Forensic Toxicology Accident Report on the samples taken. The report indicated:

Diphenhydramine detected in Urine
Diphenhydramine detected in Blood (Cavity)

The CAMI description of Diphenhydramine indicated that it "is a common over the counter antihistamine used in the treatment of the common cold and hay fever."

Fire

Soot colored discoloration consistent with a ground fire was observed on the carburetor and on the firewall mounted fuel strainer.

Survival Aspects

The airplane did not have shoulder harnesses installed and was not required to have them installed at the time it was certified. A hammer and surveying equipment were found unsecured in the rear section of the cabin.

Tests and Research

The accident engine, propeller, and vented fuel cap were sent to the engine's manufacturer in Mobile, Alabama. The engine had damaged items to include damaged spark plug wires, exhaust pipes, intake pipes, and engine mounts. Drained engine oil was strained and no debris was observed in the strainer.

The disassembled carburetor showed that there was sooting inside of the venturi area and on the upstream side of the throttle. The disassembled fuel bowl revealed no anomalies other than the liberated floats. The bowl vent strainer screen housing and its screen were deformed and replaced with exemplar items. The accelerator pump's plunger was damaged during the on scene examination and was replaced with an exemplar plunger. The fuel line inlet connection to the carburetor was damaged and replaced. The inlet screen did not contain any debris. The float and lever assembly was replaced with an exemplar assembly. The carburetor was reassembled and mounted to the engine along with exemplar spark plug wires, exhaust pipes, intake pipes, and engine mounts. The engine was mounted on a test stand and taken to a test cell for an engine run. The engine was operational during the engine run.

The vented fuel cap was visually and operationally inspected. The exterior portion of the cap was discolored consistent with exposure to sunlight and weather. The venting passage was found to be blocked and further inspection showed that there was debris in its internal cavities.

Additional Information

The airplane operator reported that he came across an article in the Cessna Pilots Association (CPA) magazine about vapor lock in the 172 series Cessna airplanes. The CPA article is appended to the docket material associated with this case.

Party members were asked to see if vapor lock applied to this Cessna 175 investigation. The airplane and engine manufacturers' safety representative indicated that there is no history of a design issue or any issue in reference to vapor lock.

Advisory Circular 91-65, Use of Shoulder Harness in Passenger Seats, in part, stated:
The [National Transportation Safety Board] found that 20 percent of the fatally injured occupants in these accidents could have survived with shoulder harnesses (assuming the seat belt fastened) and 88 percent of the seriously injured could have had significantly less severe injuries with the use of shoulder harnesses. Energy absorbing seats could have benefited 34 percent of the seriously injuries. The safety board concluded that shoulder harness use is the most effective way of reducing fatalities and serious injuries in general aviation accidents.

Administrative Information

Investigator In Charge (IIC):	Malinowski, Edward
Additional Participating Persons:	Jonathan Moss; Federal Aviation Administration; Little Rock, AR Mike Council; Continental Motors; Mobile, AL Jan Smith; Textron; Wichita, KS
Original Publish Date:	March 8, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93341